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PRESS NOTICES.

"The State Superintendent of Public Instruction, A. S. Draper, has notified Mrs. George Hemiup that her book "Law of Heat," also the paper containing her original ice theory, first published in the *Rochester Evening Express*, May 5th, 1866, will be preserved in our educational exhibits of the State. Her theory (advanced in 1866) that expansion of ice is due to electrical heat, thereby harmonizing the law of expansion and contraction, is taught in our schools and generally adopted even by those who formerly opposed it. The correspondence of the most noted American scientists embodied in the book discloses the fact that they never dreamed of harmonizing the law until addressed by Mrs. Hemiup. In her book she advances reasons never before given to the public—the theory of electrical heat causes glaciers and snow in vast quantities on the Alps, etc."—*Geneva Gazette*.

"Mrs. Hemiup's 'Law of Heat' is a thoughtful woman's contribution to a subject of great scientific interest and it is worth reading."—*St. Paul Pioneer Press*.

"'Law of Heat.' Original observation by Maria Remington Hemiup. Persons scientifically and inquisitively inclined will take pleasure in studying a work of this character."—*Cincinnati Am. Chris. Review*.

"General Law of Heat in connection with Hypothesis of Planetary Movement. By Maria Remington Hemiup, Geneva, N. Y. The *Inter Ocean* believes in fair play in all cases, and in this case it does not believe that Mrs. Hemiup has had fair treatment by scientists. The facts seem plainly proved that as long ago as May 5, 1866, she published her theory of 'expansion of ice,' plainly different from any prior teachings of science or scientific men. The accepted teaching upon this subject was that ice was an exception to the general law. * * * Mrs. Hemiup claimed it was not, and in her published article briefly and modestly gave her reasons. She sent copies of her article to leading scientists and scientific journals; she held that neither rubber nor bismuth, two other exceptions, were exceptions to the general law. Two years after the idea seems to have obtained a footing in the brains of investigators and in scientific articles they had every idea advanced by Mrs. Hemiup important to the discussion. As women have been twitted for not being discoverers, common justice demands that when she does make a discovery as valuable as this the honor should be willingly accorded her. The discussion is one which will interest scientific people of all classes."—*Chicago Inter-Ocean*.

"Mrs. Maria Remington Hemiup, has published a book with the following title: 'Law of Heat.' Mrs. Hemiup reproduces and elaborates

upon her original theory in regard to expansion of ice. * * * * *
We recommend it to intelligent readers and investigators."—*Canandaigua Messenger*.

"A female scientist's work: It is not often that a woman ventures to write a book upon so purely a scientific subject as 'The Law of Heat,' which is the title of a volume by Mrs. George Hemiup, of Geneva, N. Y. * * * * * The writer should have great credit for the evident originality and earnestness of her arguments. * * * * * We shall always read with interest whatever ideas Mrs. Hemiup may give to the public."—*Albany Evening Journal*.

"'Law of Heat,' by Maria Remington Hemiup. Mrs. Hemiup published an original theory of the formation of ice in May 1866. It appeared in the *Rochester Express*, and she appears to have devoted a great deal of time since then to explaining her theory. She has written a book on the subject. It presents her correspondence with men having the reputation of being scholars, and explanations on several subjects prominent among which are the fires of Vesuvius, the heat of the sun. One ventures to express the hope that the book will be widely read, and that in the language of 'Pinafore,' it will carry full conviction to many a hesitating heart. It is pleasant to have these abstruse questions settled."—*Chicago Tribune*.

"'Law of Heat.' Mrs. Hemiup claims in this book that the expansion of ice is not an exception to the general law, but states her views together with a good deal of other matter more or less directly connected with this ice question, even including the Nebular Hypothesis, Fire Rivers, Ocean Tides and Currents."—*Harrisburg Church Advocate*.

"'Law of Heat,' by Maria Remington Hemiup. A full account of this grand vital force theory would occupy more space than we have at our command. * * * The hypothesis is so broad that it permits the writer to discuss without seeming digression a multitude of independent topics, ending with the origin of races, and the elevation of the colored people in the South."—*Northern Christian Advocate*.

"'Law of Heat,' is a very concise and comprehensive volume by Mrs. Hemiup, of Geneva, N. Y., which Judge Warmcastle has handed us for review. We find it replete with interest to those of a scientific turn of mind. It will well repay perusal."—*Martinez Daily Item*.

"'Law of Heat,' is simply wonderful. The simple, plain, concise manner of presenting facts, and original observations as well as those gained from other authentic sources, make the book of inestimable value to the student as an incentive to self-thought against, or, as opposed to accepting established error."—M. J. S. in *Geneva Courier*.

PRESS NOTICES.

"A new book entitled 'Law of Heat' by Maria Remington Hemiup. Mrs. Hemiup is an acute observer of natural phenomenon."—*L. C. B. in Boston Christian Leader.*

"In 1866 Mrs. Hemiup announced in the *Rochester Evening Express* her discovery, expansion of ice in harmony with the general law. Previous to the publication of Mrs. Hemiup's ice theory all scientists on both continents with common consent agreed that the law conflicted. They claimed that not only water but India-rubber and the metal bismuth were exceptions to the law. Mrs. Hemiup pointed out phenomenon harmonizing the general law. She now announces other important discoveries, all growing out of the law of heat, and points out in a clear and forcible manner actual phenomenon heretofore unobserved."—*Geneva Advertiser.*

"'Law of Heat' is a new book published by Maria Remington Hemiup, a well known Geneva lady. The State School Superintendent announces the fact that the work is to be preserved in the educational exhibits of the State at Albany, N. Y. The correspondence of noted scientists embodied in the book establishes the fact that the theory of electrical heat occasioned by pressure and friction in the formation of ice is original with Mrs. Hemiup."—*Cor. Rochester Union and Advertiser.*

"'Law of Heat' is an interesting scientific volume from the masterly pen of Maria Remington Hemiup. The book abounds in originality, investigation and individual discovery. In 1856 Mrs. Hemiup published a theory purely her own, in regard to the expansion of ice being due to electrical heat which was in direct opposition to the teachings of established scientists, but in less than two years it found its way in advanced scientific thinking and became an established fact. It is only one of hundreds of instances where woman's brain is proving itself the equal if not the peer of man's, in many lines of research, discovery, thinking and invention. The hypothesis of the book is so broad that the genius inspired writer is enabled to discuss countless topics without digression, which shows her pen is as strong upon every day subjects as it is on science. Her pungency and severe radicalism reminds one very forcibly of Jane Grey Swinshelm. The book is a strong one, and is evidently written by a woman who believes in doing her own thinking."—*The Fargo Journal.*

"'Law of Heat' is quite an original book in more ways than one—the author claims to have discovered a new science."—*Albany Argus.*

LAW OF HEAT.

SUPPLEMENT.

ORIGINAL OBSERVATIONS AND DISCOVERY.

THE NEW SCIENCE.

ICE THEORY IN CONNECTION
WITH MOLTEN RIVERS.

BY

MARIA REMINGTON HEMIUP.
=

AUTHOR AND PUBLISHER,
GENEVA, N. Y.
1894.

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11 Entered March 12 th 1894

PREFACE.

The thoughts advanced, are original, and clearly defined. If gentlemen consider the ideas worthy of consideration, I hope they will be honorable in the future and give credit to the author.

The writings now extant of scientists on both continents bear testimony, that they were in blissful ignorance of the fact, that cold produces heat by condensation of water, when I published my ice theory, May 5th, 1866, in the *Rochester Express*, headed, "Does God's Law Conflict, or is it Man's Reasoning?" Even, long after this, their lectures, all their books and magazine articles show, that, they never dreamed of such a thing until I addressed them.

My discussion with the most noted of American chemists regarding this subject (their letters to me) reveal this statement to be a substantial fact. But look at the change!—This observation, is now in both continents, dished out on the table of science, as common food, without even a hint of acknowledgment to the author.

The question comes up, is there no honor among men, who are pretenders of science? A class of men who took great care to build college walls between women and science, were two-fold bound, to make acknowledgment for important scientific discovery that was made by a woman, outside of the pale of science.

Even opening college doors to women at this late date, can never make amend for such open piracy. If my theory is worth anything, it should be considered in its purity—it does not belong to any old gravitation theory—neither do I wish it disfigured and plastered with molecular nonsense. There is a large growth in the sea, resembling sea-weed, but investigators claim it is an animal—that it has a reaching-out tendency—an absorbing capacity for small animals. In the molecular theory there is resemblance to the creature, for it has a reaching-out and absorbing tendency for little ideas. With a labyrinth of language, it is effective (in small degree) in disguising piracy. But when it undertakes to absorb important and original matter, that in no way belongs to it, it is led into entanglements.

If its expounders will give up ideas altogether—and stick to the big words, they will yet make it a success. I once saw a boy roll a very fine apple in snow until the snow-ball was so large, he was unable to move it. When he called others to assist him, the snow-ball went to pieces and out came the apple.

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THE NEW SCIENCE.

In 1866 when I announced my discovery that, cold produced heat by sudden condensation of water—such men as Prof. E. Pickering of Harvard University doubted it ; and Prof. B. Silliman of Yale University scouted it. A few others whom I addressed later, were less honorable than the first, for while they accepted the main points at issue, they failed to make acknowledgment, or give credit to the author.

When I detected cold produced electrial heat in the formation of ice—I said to myself, this discovery forms one pole to the axis of a new science.

When I next, discovered, that matter spread out, cannot be warmed by any power known, to either, nature or science—that heated matter spread out instantly becomes cold—in this connection, a fact (overlooked by scientists), upsets the accepted opinions regarding the formation of planetary bodies issuing from a boiling, sizzling nebula. An amount of heat sufficient to expand the substance of our planet to invisibility would spread it out many millions of miles beyond our highest mountains. This spreading out of matter would instantly produce a temperature colder than anything within the range of our present knowledge. Investigators have attributed the cold that pervades space above the mountains to a substance, a cold ether, when it is only attributed to the spreading out of matter—all matter is cold when spread out. Even water in close companionship, at a low temperature cannot become ice until portions of it (the center of crystals) are set free, passing out in the form of vapor—thus relinquishing close companionship. This discovery formed the other pole to an axis around which revolves a new science.

In 1886 under copyright I promulgated my views regarding the formation of planetary bodies. It was more than a theory. It had a basis of facts, that neither the present or future can upset. As soon as the books were received from the bindery, they were

promiscuously distributed among many prominent libraries in this country and in Europe.

In the summer of 1893, a New York journal commented on a paper read before the Belgian Academy on the formation of bodies in the universe by Langrange who advances the idea, that "on the formation of bodies in the universe, heat was nil, that the temperature was raised above absolute zero through condensation of matter, and consequent enormous development of heat the earth would attain at least fluidity necessary to its form and geological character."

If the New York editor who refers to "this original and remarkable theory," will step into libraries of either the American Institute or the Geographical and Statistical Society of New York, and call for HEMIUP'S LAW OF HEAT—read chapters on nebular hypothesis and primeval morning, he will find the theory set forth by Langrange (the original ideas) all aside from a plastering with the old gravitation theory, were not born new to the public in the year 1803, but were promulgated by me in connection with planetary formation in the year 1886.

But the theory of cold producing heat, by condensation, was first promulgated by me, in my ice theory, through the *Rochester Express*, May 5th, in the year 1866. Nine months later it was republished in the *Geneva Courier*. A few of these papers are now preserved in public libraries. One is preserved in the Educational Exhibits of the State at Albany, N. Y.

DEFINITION OF TRUE ANCHOR ICE.

The question is often asked, why does ice form on the bottom of streams, when water does not freeze on the surface?

Before giving my reason for this phase of freezing, I find it practicable to go back to the first cause of ice crystals being lighter than water, as stated in my former observations, first given to the public, May fifth, 1866, through the *Rochester Express*, and again

republished 1886, with discussions that grew out of it, in my work entitled *Law of Heat*.

In surface ice, it is first little particles of water that freeze and form ice crystals. In the process of freezing water condenses to the extent, that, in the formation of ice crystals through condensation of water, electrical heat is engendered which sets the center of each crystal free—the center passes out in the form of vapor.

In this connection, I will now proceed to explain what my observations lead me to believe is the cause of anchor ice.

We must recognize the fact, that when the temperature drops suddenly to the freezing point, the bottom of streams are much warmer than on the surface.

Ice crystals rendered light from cause I have explained, if formed on still water, the majority remain perfect and unbroken, and are thereby enabled to float on the water, each crystal contributing its part to the formation of an ice cover.

Numerous crystals, if not the majority, formed on running water, are rent, or broken, leaving passage way to center of crystals for water to enter—centers recently set free by means of electrical heat. Crystals rent, or broken; and thus rendered heavy by means described, sink to the bottom of a stream.

This process of freezing when continued long enough, imparts a general chill to stone and gravel in the river bed where fragment crystals adhere.

This ice is true anchor ice, for it is heavier than water and could not rise when broken off and set free without assistance from other ice with perfect and unbroken crystals.

So long as ice crystals continue to descend, cold is imparted and freezing finally commences at the bottom.

Fragment crystals adhere with great tenacity to stone and gravel on the river bed.

Moving water augments freezing already commenced. Particles of water that adhere to, and are confined between true anchor ice crystals are in turn frozen. Later crystals congealed in the manner described, are held in position and protected by true anchor ice. The last formations are perfect crystals with their centers free.

This ice is lighter than water, and assists true anchor ice to rise and float upon the water when detached from its moorings.

LAKE OR POND ICE—COLD IN THE SEA BOTTOM.

Why does ice, on still water, sometimes sink? Why does the same ice that sank rise again and float on the water?

The first phenomenon is fully explained (chapter nine) in my work entitled *Law of Heat*.

The two phases, when viewed separately, have occasioned reliable observers to disagree as decidedly as did the two blind men who went to view the elephant. The first man only examined one of the elephant's ears, and determined that "the creature was like a large fan." "No," said the other, who grasped the trunk, "the beast is more like a tree."

On this principal, many disputes and much controversy occurred regarding ice that formed on Seneca Lake in the year 1857.*

The question is in dispute even to this day. Parties who witnessed a horse race on the lake the second week in April, and then the day following (Sunday) saw the ice disappear suddenly, leaving no trace, and the lake as clear as could be—the same observers, who did not visit the lake Monday, (the next day,) refused to believe the statements of other witnesses who observed large cakes of ice covering its northern beach, extending south for two or three miles. While passengers on board the steamer claimed they encountered ice cakes on the whole line of the lake.

The observations of each party, so far as they observed, were entirely correct.

When the air is still, ice crystals soften under a penetrating sun. When they are thus softened from the top, they fill with water.

It is only ice on the surface that is softened in this way—softening cannot progress far before weight is augmented and the ice sinks. It is only surface ice that is rendered heavier than water from the cause I have explained.

The ice under remains lighter than water; the same as in its

* It is an unusual occurrence for this lake to freeze over. It has only happened twice since the memory of man.

first formation. But, it is attached to and carried down with the heavy ice.

In this movement, many softened crystals are washed away—but not all. If they were, the ice would not turn over, as it always does, when it breaks up and rises to the surface. The heavy ice is under, the little that remains undissolved, and the lighter ice, that was under, now asserts its freedom; turns over, and comes to the top.

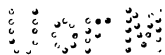
Seafaring men claim that icebergs, many miles in extent, suddenly disappear. This statement is in harmony with my theory of ice. When this ice goes down, after a time it turns over, (more probable at its first move). The heavy ice is brought under—this ice, I distinguish as fragment ice, because its crystals are rent from the top, leaving passage way for water to enter. After a time the fragment ice separates from the other ice and remains at the bottom of the sea, occasioning the cold that is found on the sea bed near the equator. The lighter ice, now free, rises to the top, and woe to the ship that should happen in its way!

MOLTEN RIVERS.

Additional evidence is falling into line, in manifestation, with every earthquake and upheaval in proof of my molten river announcement of 1886. Mountain ranges are certainly their work—they have a zigzag winding appearance peculiar to rivers—with shorter tributaries putting into the principals which extend the entire length of every continent, and finally disappear under the sea. These manifestations are not obliterated by the sea, for they send up chimneys in the form of icelands.

During volcanic disturbance in connection with mountain ranges, it will not be difficult for Geological Survey to learn, and point the route, or nearly so, of many molten rivers.

Molten rivers build continents, and spout up islands from the sea. At intervals, they shift their position, and transfer sea-bed into continent and dry land. These vulcans submerged the con-



continent of Atlantis, and in accordance with regular allotment of time, will not fail to return it, to its former elevated position.' As certain, as did Atlantis descend into night, it will again ascend into light.

Without molten rivers we could have no mountains. Without mountains we could have no ice. Above the highest mountains, cold at all times prevails—this in defiance of the sun's fire. Cold predominates in ethereal regions because the atmosphere is rare—it is matter spread out—(matter spread out, is at all times cold.) Mountain snow is formed through the influence of electrical heat. This snow is very light. It is formed from vapor sent out from each crystal in the construction and freezing of mountain ice. Electrical snow in turn feeds the glaciers.

NATURE'S PERPETUAL MOTION.

Water boils at different temperatures according to the elevation above the sea level. In Baltimore, water boils at 212 degrees F. At the Himalayas, at an elevation of 18,000 feet above the level of the sea, at 180 degrees. This phenomenon investigators attribute "to the varying pressure of the atmosphere at these points." They say "it is caused by more pressure of air to be overcome at Baltimore."

If there was no other cause than the one assigned, the opposite result would most certainly be obtained. Pressure augments heat—heat expands and sets water in motion. The basis of my argument is, first: no power known to either nature or science, can warm matter, that is spread out. For present illustration:—Place water in a vacuum. The water when first introduced into the vacuum is in close companionship. In this relation the water boils, in an effort to fill the vacuum and gain an equilibrium, and heat is engendered by motion of water while in close companionship. By this means the water expands and fills the vacuum. This spreading out of matter causes intense cold. The cold in turn acts as a condenser in bringing matter together.



It is suddenly condensed into ice and frozen vapor. This is the same order of force that at all times prevails in elevated regions above the mountains. Even the sun's fire produces no effect or warmth on matter that is spread out in the elevated regions. The only heat known there is produced by cold. By condensation of water into crystals electrical heat is engendered. In the formation of mountain ice, electrical heat sends from the centers of countless thousands ice crystals, hot and invisible vapor. The colder the temperature the more intensified heat. This heat is so much more powerful than the sun's fire as to render the temperature on the Alps milder by night than by day. Wind on the mountains, although it acts in connection with matter that is spread out, cannot produce heat. Motion cannot produce heat except it acts on matter that is in close companionship. Wind on the mountains is the result (not the cause) of electrical heat. It is heat confronted by cold in a death-like struggle for equilibrium. The war goes on—cold producing heat and heat producing cold—this is nature's perpetual motion.

WHAT IS WEIGHT?

The weight of a body, depends, in a measure, on where it is weighed. If weighed in a deep well—it does not weigh as much as when weighed at the top. This phenomenon is not in harmony with established belief of an increase of pressure as we descend towards the earth's center—but to the contrary, it is one of many facts in view of a force drawing everything to its own place, on the part of creative plan. This force I have distinguished in my former work on heat—as the Earth's Grand Vital Force. This force is not always the same, it acts from different impulse, drawing or relinquishing claim at will.

Illustration could be extended at great length. We have it in the flight of birds—at times, resting in mid air, seemingly without effort. This force is sometimes reversed, and the drawing

is opposite from the center—we see it in the water spout in the geysers, and in the cyclone that dealt out calamity to Hazel Green in Wisconsin; for the top of its column it held a stone, eight feet long, three feet thick, and three feet wide. This stone was suspended several minutes, continuing in this position when it passed over three-quarters of a mile. The column halted once, and spun around, then it again recommenced its march, holding this enormous weight in position.

This force (vital) causes a tide in our small lake, Seneca, here at Geneva, N. Y. The propelling power of every living thing, within the domain of human observation, is at all times central. If the planets and our earth are not exceptions to this natural law—then, the propelling force is within the body—not outside. In this sense we cannot weigh the planets—in connection, they have no weight.

While I recognize the earth's force having claim on every thing, creature, animal or plant that draws its substance from the earth's substance, I recognize another force—a superior force—outside the planets—the Great Grand Force. While our earth propels its way through immensity of space, it is forever doomed to move within prescribed limits, in a path marked out by the Great Grand Force.

(To be continued.)

LAW OF HEAT.

ORIGINAL OBSERVATIONS.

EXPANSION OF ICE

IN HARMONY WITH THE GENERAL LAW.

BY MARIA REMINGTON HEMIUP.

GENERAL LAW OF HEAT

IN CONNECTION WITH

HYPOTHESIS OF PLANETARY MOVEMENT.

GENEVA, N. Y.:

STEAM BOOK AND JOB PRINT.

1886.

COPYRIGHT, 1886,
BY MARIA REMINGTON HEMIUP.

PREFACE.

IN THIS WORK I purpose to republish my original theory of ICE; the same as appeared in the Rochester *Evening Express*, (May 5, 1866,) together with the correspondence that grew out of its publication. The discussion has not only been the means of establishing the hypothesis upon a firmer basis, but it also illustrates the fact that *the theory was before the scientific world at an early date and prior to any other theory in which the same or similar doctrine is now set forth by others* in view of harmonizing the apparent exception of a general law of nature supposed to have been a deviation. Previous to this no theory of any kind was ever advanced in the attempt at harmonizing the law.

Dr. L.'s lecture at Linden Hall on "Woman's Mission," in 1866, prompted me to sign my name in full to the article.

Dr. L. discoursed at great length on woman's mission of love; prescribing her exceedingly narrow limits; increasing the tone of his voice, pointed out her inferiority by asking: "Woman, what right have you to claim equality with man? Where are your researches in philosophy?" This remarkable sentence, as it rang through the hall, was to one woman of peculiar significance; it was a trumpet-blast calling her to action! Holding as I did original views which I regarded as important philosophical discovery heretofore I had hesitated in promulgating original observations because they were in opposition to doctrines of all times, without one exception.

At that date no writer had doubted that water at the freezing point was an exception to the general law of expansion. Believing with all my heart that the law harmonized with itself, the two or three friends to whom I confided my discovery believed my explanation reasonable; their only objection to the theory advanced: "We can't think you are right because if your theory is true why did not some professor find it out?"

By the advice of friends as well as my own inclination, (previous to Dr. L.'s lecture at Linden Hall,) I had decided, therefore, to never take the responsibility of giving my theory to the world in my own name, but thought to disclose the original ideas to some man—a professor—to make such use of as he pleased.

But Dr. L.'s question, "Woman, where are your researches in philosophy?" changed my purpose; my soul thrilled with emotion! Impressed with the idea that all truth was of God, I was overwhelmingly impressed for the moment; felt that the thought was imparted to me because I was a woman to hush such arrogance as Dr. L.'s. While I sat in the presence of Dr. L. I made a vow in my heart that I would not only take the responsibility of publishing my original views in regard to the expansion of ice, but I would also give my theory of gravitation, and give it in the name of A WOMAN.

But a few weeks expired after this event before my theory of ice appeared in the Rochester *Evening Express* with this heading: "Does God's Law Conflict, or is it Man's Reasoning." The date was May 5, 1866, as the files of the *Express* will now show. Nine months later it was republished in the Geneva *Courier*. I procured two hundred of the *Couriers*; these, in addition to twenty of the Rochester papers, were distributed among college professors and scientists in nearly every important college in the land. Both letters and printed matter in the great majority of cases were treated with utter silence. But, as a proof of their effect, turn back to the writings of scientists previous to the distribution of

my papers—their books, magazines, lectures, all school-books, everywhere and in all lands.

It was decided with one common consent that the law of expansion and contraction conflicted with itself. A subject that previous to the distribution of these papers had called out so much general interest, eloquence of writers, and eulogy on the part of public speakers, because of "God's goodness" in permitting a wonderful deviation of his law for man's benefit—this was suddenly hushed into silence, affording me abundant proof that the papers were carefully read and considered if not acknowledged.

I very respectfully submit in these pages for consideration the original article on expansion of ice from the Rochester *Evening Express*,* and the discussion that grew out of it; also more extended views in regard to the general law of heat in connection with my hypothesis of planetary movement.

MARIA REMINGTON HEMIUP.

*Or more especially as it appeared nine months later when republished in the Geneva *Courier* (the same with the exception of a few typographical errors corrected.) The Geneva *Courier* was the paper that I invariably distributed among scientists.

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CHAPTER I.

EXPANSION OF ICE.

[For the Rochester Evening Express.]

DOES GOD'S LAW CONFLICT, OR IS IT MAN'S REASONING?

It is an authenticated fact that "bodies expand and contract under the influence of the increase or diminution of heat. By its increase solids are converted into liquids, and liquids into vapors; by its diminution vapors are condensed into liquids, and liquids are again condensed into solids."

The effect of heat on a body is to increase its expansion in all directions. Steam occupies a space about 1700 times larger than it will when it is condensed into water. The density of all substances is augmented by cold and diminished by heat. Steam is irresistible; when closely compressed its elastic power often bursts the vessel in which it is confined.

The expansion of water is in proportion to heat; it can be seen before boiling commences; but as it decreases in temperature towards the freezing point, exhibits a phenomenon which (when not understood) is wholly at variance with the general law that bodies expand by heat and contract by cold. And so far as I have any knowledge, it has been and is claimed at the present time by all writers who treat of Natural Philosophy or physics, that the general law that bodies expand by heat and contract by cold is in collision, and conflicts with itself.

My attention was attracted to this phenomenon by reading the following (Wells' Philosophy):

"Water attains its greater density, or the greatest quantity is contained in a given bulk, at a temperature of 39 deg. F. As the temperature of water continues to decrease below 39 deg., (the

point of its greatest density,) its particles, from their expansion, necessarily occupy a larger space than those which possess a temperature somewhat more elevated. The coldest water, therefore, being lighter rises and floats upon the surface of the warmer water. On the approach of winter this phenomenon actually takes place in our lakes, ponds and rivers. When the surface water becomes sufficiently chilled to assume the form of ice it becomes still lighter and continues to float. Again; if ice was not lighter than water it would sink to the bottom, and by the continuance of these operations a river or lake would soon become an immense solid mass of ice, which the heat of summer would be insufficient to dissolve.

“Among all the phenomena of the natural world there is no more striking illustration of the wisdom of the Creator and of the evidences of design than in this wonderful exception to a great general law.”

It appears to me much more reasonable to suppose man's reasoning is in collision than to attribute it to God's general law. Wells is not the originator of such an hypothesis, but I quote from his treatise because I believe it to be a standard work in academies and schools at the present time.

Before attempting to elucidate, I will quote again to show the force exerted by the expansion of water while freezing:

“Cast-iron bomb-shells, thirteen inches in diameter and two inches thick, were filled with water, and their apertures or fuse holes firmly plugged with iron bolts. Thus prepared they were exposed to the severe cold of a Canadian winter at a temperature of about 19 degrees below zero. At the moment the water froze the iron plugs were violently thrust out and the ice protruded, and in some instances the shells burst asunder—thus demonstrating the enormous interior pressure to which they were subjected by water assuming a solid state.”

I must acknowledge it puzzled my brain several days before I could define the cause; but I never doubted for one moment that the collision was with my brain and not with God's law. And when I felt the mystery was solved I was highly gratified, but not to the extent that Archimedes was when he discovered the specific gravity of bodies. However, enough to exclaim, “Yea, let God be true, if every man a liar.”

Now I will attempt to explain, and trust I shall be able to show beyond a doubt, that the law does not conflict, but harmonizes with itself.

I assume that heat always causes bodies to expand, and that cold always causes bodies to contract, but never expand. And I also assume that it was *heat* that caused the shells to burst, and not the cold. As electricity is diffused throughout all space it pervades water to a certain extent, and it always remains in a latent state except it is excited to action by some disturbing influence.

And again; as cold increases in temperature the water increases its density, and when it reaches the freezing point it condenses to that extent that the pressure and friction excites the electricity to heat and converts little particles of ice into steam,* which moves with great velocity and power; as the steam rushes out the cold air rushes into the little voids and takes the place of the steam, which causes the report called cracking of the ice. I claim that cold water is always more dense than that of a more elevated temperature, and can not rise upon the surface of that which is warmer,† but continues to sink so long as it remains in a liquid state. It is first little particles upon the surface that are condensed into ice, and they would instantly sink if they were not arrested in their course and rendered light by the above mentioned process. Pressure and friction excite the interior portions of the ice and cause little particles of steam to rise (commonly called bubbles of air). It was in this way the bomb-shells were burst asunder, and not by the conflicting of God's law. In a strict sense it is not steam that first escapes, but, in other words, water in a more expanded form than steam, so much so that it ceases to be visible; its escape into the cold air is rapid, and it is immediately condensed into steam and is then visible; the steam is again condensed into ice‡ and returned to its allotted place.

Several years ago, when I first came to reside by the shores of a body of water, I was much deceived and exceedingly astonished on the approach of severe cold weather at a phenomenon the water

*The centre of each crystal into invisibility.

†The reader will find full explanation in regard to this phenomenon by turning to my correspondence with Prof. Silliman: (read my response to his criticism.)

‡Snowflakes, (turn to my explanation of how the Alps are covered with snow.)

presented while in the act of freezing. In the morning I rose and dressed in a warm room, and as I looked out (from my window) at the lake, my attention was attracted by something that had the appearance of large clouds of steam; and at once the thought was suggested that it was so cold during the night that the water had commenced freezing, and there must have been a sudden change for it was now thawing rapidly. And I remarked to one of my family that had been out of doors, (there was a sudden change; it was much warmer than during the night). But the remark caused the house to resound with laughter at my expense. I was then informed it was the coldest day as yet of the season; but I pointed toward the lake and inquired if they did not see it was thawing? I was then told it always had that appearance when freezing. I am now convinced it was steam—just what it appeared to be.

The steam never rises far before it is condensed and returns to its starting point, thus illustrating the great wisdom and goodness of the Creator, and showing that His law is as wise as it is good; and as good as it is wise.

This theory explains the cause of ice being thrown into the variety of shapes that it is; or in other words, the cause of ice being crystalized water.

MRS. GEORGE HEMIUP.

Geneva, N. Y., May 5, 1866.

CHAPTER II.

A PROFESSOR'S PREDICTION VERIFIED

The summer following the publication of my ICE theory—during a religious convention that convened in Rochester—I met at a friend's house a gentleman supposed to be a delegate. One of my friends handed him a Rochester *Evening Express* containing my article; he read it aloud in the presence of witnesses, and appeared quite interested. And in his presence I related a prediction of a German professor in my own town, whose wife was my friend and neighbor, wherein my friend had one day read an article to her husband, (the professor,) on "tact and genius." "Genius invented but received no benefit for the same; but by and by tact got hold of the invention or discovery of another and turned it to his own account, and with a big bluster tact received the credit." After listening to this reading the professor exclaimed to his wife, "that will be the way Mrs. H. will come out with her philosophy—she will never receive the credit—some man will turn it to his own account."

I was greatly surprised and chagrined, after this event, on taking up the *Scientific American* of November 25, 1868, and reading an article setting forth views only original with myself—a man claiming it as his own and giving the same name and place of residence as the man who listened so attentively to the German professor's prediction in regard to Mrs. H.'s theory. This thing was doubly humiliating, inasmuch as after the professor's prediction I subscribed for the *Scientific American* for the principal reason of watching and protecting against piracy. Previous to this event I had also sent my theory to that journal for consideration, and in response received from the editors a private note stating it was beyond their researches in that direction, but there was no intimation or acknowledgment in their journal, although I

wrote for redress. The words of Dr. L., "Woman, where are your researches in philosophy?" came back with startling meaning, accompanied this time with the answer: "They have been gobbled up by the other sex."

CHAPTER III.

CORRESPONDENCE.

The earliest date of acknowledgement on the part of distinguished men came to me from the President of St. Lawrence University, (Professor R. Fisk,) Dec. 8, 1868. It was as follows:

MRS. GEORGE HEMIUP:

Dear Madam—Your very interesting communication came to hand in due time, but various engagements and absence from home have prevented my replying sooner.

It is now vacation with us, and our next term opens on the 16th. At that time Professor White—our Professor in Natural Science—will have returned. I will submit your letter to him, to take such notice of as the subject may seem to him to deserve. I will have him find the article in the *Scientific American* to which you refer, if it can be found here.

Yours very truly,

R. FISK, JR.

December 29, 1868, I forwarded the following letter to the Hon. C. P. Daly, LL. D.:

I send you the following article for consideration, hoping and trusting that you will place it in the hands of honorable gentlemen, and not those like the disciples of Ptolemy who were so puffed up with their own knowledge that in some instances they refused to look through the telescope; "they declared the whole a deception and unworthy the attention of true philosophers." The theory is original with myself—was written for and published in the Rochester *Evening Express* May 5, 1866. I find the theory already being accepted in certain quarters; however, am sorry to add, its acceptance is not in a very honorable way. Certain gentlemen are advancing the views set forth in my theory without giving credit to the author.

Respectfully,

MRS. GEORGE HEMIUP.

NEW YORK, March 29, 1869.

MRS. GEORGE HEMIUP:

My Dear Madam—The pressure of public engagements must be my apology for not having returned an earlier answer to your letter. Though the subject of it is one that lies in the domain of physical geography, I feel that it is one upon which the opinion of some eminent chemist be expressed, and I will see that it is placed in the hands of some gentleman directed to that specialty, either in our own Society or in the American Institute, and will request him to communicate his views respecting it. I am, dear madam,

Very sincerely yours,

CHAS. P. DALY.

ST. LAWRENCE UNIVERSITY, April 20, 1869.

MRS. GEORGE HEMIUP:

Some time last winter President Fisk of our University handed me a letter written to him by you touching the matter of the expansion of water below 39° &c. He thought I might as Instructor in Natural Science be interested in the matter, and requested me to answer it.

I intended to do so at an early day, but immediate duties prevented, and soon after I was called away; even now, no time for any extended remarks.

Should you desire any further notice of the matters contained in your letter we shall be happy to do all we can to set the matter in its true light. Without expressing at the present writing a decided opinion in regard to the theory advanced, I have no hesitation in saying that it is a subject well worthy the attention of all. Allow me to suggest that in the presentation of the subject some remarks in regard to the nature of steam, both as proper steam, (that is when it is so transparent as to be invisible,) and as vapor would be pertinent. As water expands below 39° before it becomes ice, the question might be asked, why at the instant of the escape of steam do not the particles of water (it being fluid) immediately adjust themselves to the new status and thereby prevent the expansion of the mass?

Other questions might be asked, but as I said I have no time at present to enlarge. President Fisk is away, and I have the oversight of the University in addition to other duties. I should be interested in the articles to which you refer, and if convenient would like to receive them. I shall be most happy to render any assistance in my power both in making any suggestions should they be desired, or in bringing the matter before the public. Shall be glad to hear from you upon the subject.

Respectfully yours,

N. WHITE.

RESPONSE.

APRIL 29, 1869.

PROFESSOR N. WHITE, D. D.:

It was with much pleasure I received your communication of April 20th. Believe me, I appreciate your kindness and willingness to aid me. Since receiving your communication I have also received one from the Hon. C. P. Daly, LL. D., President of the American and Geographical and Statistical Society of New York. He evinces magnanimity, and assures me the "subject shall be placed in the hands of gentlemen directed to the specialty, either in his own society or the American Institute, and will request them to communicate to me."

He evinces more generosity than the disciples of Ptolemy. Had Galileo been possessed with such a disposition as his persecutors, he would have disdained to build a telescope because the principle upon which it was constructed was discovered by children.

You ask the question, "Why at the instant of the escape of steam do not the particles of water (it being fluid) immediately adjust themselves to the new status and thereby prevent the expansion of the mass?"

My article was written for a newspaper; in consequence it was more concise than it should have been, therefore not as plain. It is evident this deficiency which has given rise to your enquiry, and you have my hearty thanks for expressing it, thereby giving an opportunity of explanation. It is first minute particles that are converted into ice, and the centre of these particles which are disturbed and converted into steam by condensation and friction. The steam moves from its countless prison cells with the rapidity and velocity of lightning, leaving the shell or "mass" distorted and thrown out of shape, consequently occupying a larger space than it would had it not been thus disturbed. You suggest that other questions might be asked. It will be with much pleasure that I shall explain and reply to any objections which may be stated to me. If any theory is true it will come out all the brighter by being sifted; if not, then let it crumble. I have never doubted for a moment its ultimate exceptance. I shall be delighted to hear from you again. Your communications will not only be appreciated but promptly answered.

With much respect,

MRS. GEORGE HEMIUP.

SECOND LETTER FROM PROFESSOR WHITE.

WALLINGFORD, VERMONT, July 17, 1869.

MRS. G. M. HEMIUP:

Yours of the 27th of June was received some days since, being forwarded from Canton. I intended to reply before this but the distressing illness of my mother has prevented, and I will now, in the broken moments of intervals of comparative ease.

I am much interested in your reply to my questions.

The question was put partly at random and after a very hasty perusal of your letter to President Fisk. The answer clears up some of the difficulties attending the subject. Perhaps I ought to say that my attention was drawn to the subject in 1864, while residing at Pulaski, Oswego county, N. Y. In connection with Rev. Jas. Douglas the question came up, to wit: that heat expanded universally while cold (speaking popularly) contracted. Water as an illustration was also mentioned. But the discussion turned mainly upon the behavior of heat with reference to india rubber and feathers, held commonly to be with water exceptions to the general rule. I have often brought the subject before my classes, but often attempted theoretically to account for the apparent exception in regard to rubber, &c. I thought it might be a matter of some interest to you to know that my attention was long ago called to this subject. Such matters have great interest for me and I trust your investigations will add to the general interest already taken in this country in questions of like character.

Of the questions I now propose but one. I have no time to devote to the subject as I would like, and the present question is quite comprehensive, namely:

Admitting that the expansion below 39° be caused as you say by the bursting of the little vapor balloons with icy covering, must not the edges of the ruptured covering be ragged? Now, ice crystals are hexagonal, all having six sides, and these are arranged with perfect order in the mass. If we take a stick and strike with the end of it upon a block of ice, holding it perpendicularly, there will be six radiations or partings of the ice from the point where the blow is received; further, whenever ice be broken the line of rupture is perfectly smooth.

Now if we further admit that the line of rupture of each of the minute vapor cells be smooth, on what principle do they all arrange themselves in the cooled mass with such regularity?

I have a theory on the subject consonant with the conclusions at which you arrive, but you would rather I doubt not first reply, and I shall be much interested to know how far our views coincide.

I have said that many questions are suggested by the general question, but you will readily see that I cannot now enter further into the discussion. I should like very much to talk with you upon the subject of so much interest. You do well to subject your theory to the kindly criticisms of friends before taking the final step with regard to it.

Surely the days of scholastic pedantry are numbered, except with the ignorant. The disciples of Ptolemy and Pythagoras had long before lost the magnanimous spirit of their great leaders ere they treated new discoveries with scorn. Knowledge is but another name for humility. "We are nearer wisdom," says Wordsworth, "when we stoop than when we soar." He who would gather golden truths must bend down to look for them.

If in the future any of my thoughts upon the behavior of heat in reference to other substances would be of service to you, you shall be quite welcome to them. I will only reiterate what I have said before, namely; that you may command my services in any way that the cause of truth or science may be furthered.

Before closing permit me to add, that the matter of Scientific Discovery has for a long time engaged my attention. The only lecture I ever wrote in great part is entitled, "How Discoveries are made"—a subject in which you would be interested. It is pleasant to know the paths that others have trod—the toils to which others have subjected themselves—the similar hopes and fears entertained by them in common with ourselves. If your theory is true (of which I have but little doubt) truth will raise up friends for you—it will never die. Besides, whosoever so loves *truth* as to enter into solemn conspiracy with it, does or should have such an innate love of truth therefore as to find joy in defending it whether it ever prevails among men or not.

I should like to hear from you further. It would afford me pleasure to devote time for further investigation, but more important and paramount duties prevent.

Finally, I assure you of my sympathy and willingness to co-operate in any way, that truth may have freer course among men. In the community of the learned there is no age, sex or condition, but truth alone, and in this spirit should we learn to labor and to wait, in perfect confidence for its ultimate and glorious triumph.

Very respectfully,

A. WHITE.

ANSWER TO PROFESSOR WHITE'S SECOND LETTER.

GENEVA, N. Y., August 7, 1869.

PROFESSOR WHITE, D. D.:

I have received your letter of July 17th, and return my hearty thanks. I have read it over with great attention and pleasure. I am much interested in finding that I "have succeeded in removing some of the difficulties attending the subject." You speak of the apparent exception in regard to india rubber. You also state that you "have often brought the subject before" your "classes, but have often attempted theoretically to account for the apparent exception in regard to india rubber"—in what way you do not state, and as you ask my views upon the subject I freely give them hoping we may agree in both theory and sentiment.

Perhaps you have read the New York *World's* criticism (December 25, 1868,) of Prof. Silliman's lecture* on "The Teakettle." The *World* treated the professor sarcastically because he mentioned water as an isolated exception. The *World* enumerated india rubber, also the metal bismuth, as being among the exceptions. Now I hold that God has fixed and determinate laws which never deviate from their course; that His wisdom is equal to His goodness, and His goodness equal to His wisdom; and that whenever we deviate from this rule of reasoning we are baffled at the outset. Had theologians held to this rule of reasoning it would have occasioned a great diminution of human misery in times past. Not only in times past there has been, but even at the present time there is, much prejudice pampered and kept alive. Theologians have sometimes reasoned that God's goodness was not quite equal to His justice and wisdom; and philosophers assume that His wisdom is not equal to His goodness. The supposed deviation of water is brought forward as proof of the fact.

You will understand by my remarks that I do not believe india rubber or the metal bismuth exceptions to the general rule. I hold that india rubber does not contract by heat—that it is the phenomenon of expansion or evaporation mistaken for contraction. India rubber is very susceptible to heat, and undergoes chemical change. Any amount of heat sufficient to cause india rubber to contract is

*Before the American Institute.

also sufficient to bring it sensibly in contact with the olfactory nerves as portions of it pass off in vapor. Those which remain sensitively adhere to each other. An illustration of it may be seen by burning leather, and sometimes paper or cloth. Repeated heating of rubber destroys its cohesive quality. Rubber cord by being worn soon loses its cohesion—it is destroyed by the simple heat of the animal body.

Your last question is, "If the expansion of water be caused as you say, why not the edges of the ruptured covering be ragged?" You also state that "ice crystals are hexagonal, all having six sides, and those are arranged with perfect order in the mass." I respond, as like causes produce like results, so each crystal being the result of the same process as the other, in this instance we see a striking illustration of the same order which God in His wisdom displays in all His works.

Again, your lecture—subject, "How Discoveries are Made"—could not fail of interest to me. Hoping to hear from you again, you very sincerely have my regard.

Respectfully yours,

MRS. GEORGE HEMIUP.

CHAPTER IV.

QUOTATIONS FROM PROFESSOR SILLIMAN.

THE "NEW YORK WORLD'S" CRITICISM OF PROFESSOR SILLIMAN'S
LECTURE BEFORE THE AMERICAN INSTITUTE.

Inasmuch as the *World's* criticism of Prof. Silliman, because he neglected to count india rubber as well as the metal bismuth among the exceptions to the general law, was the occasion of my observations in regard to rubber, wherein I discovered phenomenon that led me to believe that india rubber was not a deviation from the general law, it is, therefore, important that I transfer to these pages such portions of the lecture as refer to the expansion of water at the freezing point, as well as the *World's* criticism. Professor Silliman being a representative man with scientists on this continent at the time he gave the address—his views were the same as held by all scientists upon the same subject on both continents—his lecture bears testimony that at that time he never dreamed of such a thing as that in but little more than a year his associate* in Yale College and contributor to his *Journal of Science* would contribute a hypothesis harmonizing the law in any way. If Professor Silliman had suspected such an event, his lecture would have presented a very different phase. The quotations from his lecture are from the *New York Tribune*—(delivered December, 1868):

"After some remarks upon the phenomenon of heat he said: 'This vessel which we are heating has now become filled with bubbles.† Fishes breathe water because it contains atmospheric air, while it is richer in oxygen than common air. The first phenomenon, therefore, in seeing that the kettle boils is the displace-

*W. A. Norton.

†If these bubbles are air why do we see them condense into vapor and run down on the window pane?

ment of the air. Every one has noticed that the melting of ice in the spring causes a great chill in the atmosphere; for whenever and wherever ice is melted it absorbs inevitably 120° of heat. On the other hand, the vaporization of water takes up a great deal of heat, which is rendered latent.*

"Prof. S. next proceeded to illustrate the irregular expansion of water near the freezing point. He filled a vessel with water at 55° , and surrounded it with ice and salt to reduce its temperature. A freezing mixture is composed of two solids having an affinity for each other, but which cannot unite without becoming a fluid; and in order to become fluid a large amount of latent heat is required,* which must be borrowed from the surrounding substances. In the vessel of water he immersed two thermometers, one near the top and the other near the bottom. As the temperature of the water fell the lowest thermometer descended to $39\frac{1}{2}^{\circ}$, and there remained stationary, while the upper thermometer continued to fall, and at last reached the freezing point. Why does not that system of current keep going on like the boiling of water in a flask, so that the whole shall freeze at the same time? That is just where the WONDERFUL EXCEPTION TAKES PLACE, and it is the GREAT DELIGHT of a devoted mind to believe that the exception is a part of the original intention of the GREAT ARCHITECT in the formation of the world, in adapting it to be inhabited by human beings, because we may readily believe that, *except for THIS IRREGULARITY in the exception of water*, the WORLD WOULD BE UNINHABITABLE.

"At the temperature of $39\frac{1}{2}^{\circ}$ the very contrary effect takes place, and the water begins to expand; it increases in bulk and consequently becomes specifically lighter, and like a cork floats upon the surface, or immediately beneath it; so that you will have the surface of the water cooled down to 32° and converted into ice, and yet that freezing does not extend much below the surface. You rarely find in the coldest winter that ice is formed more than two feet thick. If you observe a caldron of molten iron; as it cools does it solidify first on the top? No. Does a mass of lead in a ladle solidify at the top? No; but equally at the bottom. In

*"Latent heat" is most certainly ambiguous language. Heat is the result of motion; hence if there is such a thing as "latent heat" there must be such a thing as latent motion. Latent is the opposite of motion; we can not hold to the term "latent heat" and reject its parent or cause—motion; it renders the term illegitimate.

"Latent heat" (since this publication) is dropped from all encyclopedias without comment.

most cases the solid, which is the result of congelation, is heavier than the fluid in which it is formed and sinks to the bottom, whereas in the case of the water the solid is much lighter than water. We have here another exception, that the ice which is formed is lighter than the water and it floats upon it. When we see an iceberg from one hundred to two hundred feet above the surface of the sea we know that for every foot of elevation above water there are ten feet of depression beneath the surface; so that what we see is only one-eleventh of the whole bulk. Lake Superior has a uniform temperature of about 40 degrees, and beneath the surface, in the winter, in any of our lakes, we shall find water at about that temperature. This is an important fact with reference to the inhabitability of our globe, because, you observe, that if water as it solidified continued to shrink and to become heavier, the whole mass would become frozen in a single winter so that no summer would be long enough to melt it, and eternal death would rest upon the surface of the globe."

Be it remembered that previous to the distribution of my papers all scientists discoursed upon the subject of water in the same strain as Prof. Silliman. When their attention was called to the phenomenon of steam or vapor rising over a lake or pond while in the act of freezing; they invariably explained, "it was its own latent heat being set free." Professor Silliman, it is quite clear, had never heard or thought of any other view than the one he advanced at the time he gave his address before the American Institute; and yet his associate in Yale College and regular contributor to his *Journal of Science* (W. A. Norton) a year later, and after the distribution of my papers to that institution, advances a hypothesis in the attempt at harmonizing the law setting forth views only original with myself; it is mixed up quite artfully with other matter. Previous to this, his writings figured in the *American Journal of Science*, and it is a well known fact that previous to this time there was no attempt made by him in his writings to harmonize the law; but in the January number* of the *Journal of Science* (1870) he states that "the key to the explanation of the

*It was issued the last of the month.

excitement of *electricity by friction* lies in the fact made out in my former paper."

I think my correspondence with Professor Silliman will show *honestly* where "the key lies." Note the date of my correspondence with Professor Silliman.

CHAPTER V.

THE NEW YORK WORLD CRITICISES PROF. SILLIMAN DECEMBER 25, 1868.

“Professor Silliman of Yale College had a passage in his lecture the other night before the American Institute which discriminates precisely the unscientific spirit from the scientific. Expounding the fact that matter contracts in space as it descends in temperature and the exception in the case of water, which, after contracting in its descent to 40° then expands in its further descent to the freezing point, 32° , where it crystalizes into ice, the professor observed:

“‘It is the great delight of a devoted mind to believe that the exception is a part of the original intention of the Great Architect in the formation of the world in adapting it to be inhabited by human beings. * * * If water, as it solidified, continued to shrink and to become heavier, the whole mass would become frozen in a single winter so that no summer would be long enough to melt it, and eternal death would rest upon the globe.’ Professor Tyndal, the first of living scientists, had fallen in with some English Silliman, apparently, when he wrote his book on ‘Heat as a Mode of Motion’ where he says:

“‘It is hardly necessary for me to say a word on the importance of this property of water in the economy of nature. Suppose a lake exposed to a clear wintry sky; the superficial water is chilled, contracts, becomes thus heavier and sinks by its superior weight, its place being supplied by the lighter water below. In time this is chilled and sinks in turn. Thus a circulation is established—the cold, dense water descending, and the lighter and warmer water rising to the top. Supposing this to continue, even after the first pellicle of ice were formed at the surface, the ice would sink as it

is formed, and the process would not cease until the entire water of the lake would be solidified. ~~Death~~ to every living thing in the water would be the consequence. But just as matters become critical nature steps aside from her ordinary proceeding, causes the water to expand by cooling, and the cold water swims like a scum on the surface of the warmer water underneath. Solidification ensues, but the solid is much lighter than the subjacent liquid, and the ice forms a protecting roof over the living things below. Such facts, naturally and rightly, excite the emotions; indeed, the relations of life to the conditions of life—the genuine adaptation of means to ends in nature—excite, in the profoundest degree, the interest of the philosopher. But in dealing with natural phenomenon, the feelings must be carefully watched. They often lead us unconsciously to overstep the bounds of fact. Thus I have heard the wonderful property of water referred to as an indisputable proof of design, unique of its kind, and suggestive of pure benevolence. ‘Why,’ it is urged, ‘should this case of water stand out isolated if not for the purpose of protecting nature against herself?’ The fact, however, is that the case is not an isolated one. You see this iron bottle, rent from neck to bottom. I break it with this hammer, and you see a core of metal within. This is the metal bismuth, which, when it was in a molten condition, I poured into the bottle and closed the bottle by a screw, exactly as in the case of the water. The metal cooled, solidified, expanded, and the force of its expansion was sufficient to burst the bottle. There are no fish here to be saved, still the molten bismuth acts exactly as the water acts. Once for all, I would say that the natural philosopher, as such, has nothing to do with purposes and designs. His vocation is to inquire what nature is, not *why* she is; though he, like others, and he more than others, must stand at times wrapped in wonder at the mystery in which his studies furnish him no clue.

* * * Nature is full of anomalies which no foresight can predict, and which experiment alone can reveal. From the deportment of a vast number of bodies, we should be led to conclude that heat always produces expansion, and that cold always produces contraction. But water steps in to qualify this conclusion. If a metal be compressed heat is developed; but if a metal be stretched cold is developed. Mr. Soule and others have worked at this subject and found the above facts all but general. One striking

exception to this rule (I have no doubt there are many others)* has been known for a great number of years, and I will now illustrate the exception by an experiment. My assistant will hand me a sheet of india rubber, which I have placed in the next room to keep cold. From this sheet I cut a strip three inches long and an inch and a half wide; I turn my thermo-electric pile upon its back, and upon its exposed face I lay this piece of india rubber. From the deflection of the needle you see that the piece of rubber is cold. I now lay hold of the ends of the strip, suddenly stretch it, and press it while stretched on the face of the pile. See the effect! The needle moves with energy, and showing that the stretched rubber has suddenly heated the pile. But one deviation from the rule always carries other deviations in its train. In the physical world, as in the moral, acts are never isolated. Thus with regard to our india rubber; its deviation from the rule referred to is only part of a series of deviations.' In many of his investigations Mr. Soule has been associated with an eminent natural philosopher—Professor William Thompson†—and when Thompson was aware of the deviation of india rubber from an almost general rule, he suggested that the stretched india rubber might shorten on being heated. The test was applied by Mr. Soule and the shortening was found to take place."

After reading in the *World* the above quotation from Professor Tyndall, I wrote out my view of india rubber, claiming it was not a deviation; and if it has ever, up to this time, found its way into print it is without my knowledge. I very sincerely, perhaps unwisely, confided my theory of rubber to Professor Silliman at the time I sent him my printed article on "Expansion of Ice."

*Be it remembered the *World* quotes these words as late as eighteen hundred and sixty-eight from Professor Tyndal, the greatest of English speaking living scientists, showing conclusively the opinions that prevailed previous to the distribution of my papers; also my correspondence with Professor Silliman which took place November 11th, 1869, bears testimony that nothing to the contrary was known at Yale previous to my addressing them.

†These names are sufficient to sustain my claim, that Professor Tyndal was not alone—these same views were held with one common consent by all scientists everywhere and in all lands.

He never acknowledged it, but I had the precaution to send it to a number of different persons about the same time, believing some of them would be honest. Among the number were Professor White and the Honorable C. P. Daly, either of whom I have reason to believe will do me full justice.

CHAPTER VI.

ADDRESSED PROFESSOR SILLIMAN NOVEMBER

11th, 1869.

Some delay intervened before receiving a third letter from Professor White, and in the mean time I wrote and subjected my theory to Prof. B. Silliman, M. D., of New Haven, both the printed article on ice as well as my theory of india rubber. I stated in my letter that my attention to the subject of india rubber was occasioned by the New York *World's* criticism of his lecture on the "Tea Kettle." I also requested him to experiment with the metal bismuth, believing its apparent exception could be accounted for on the same principle as the other supposed deviations. In response I received the following from Prof. B. Silliman:

NEW HAVEN, Nov. 22d, 1869.

MRS. GEORGE M. HEMIUP,

GENEVA, N. Y.

Dear Madam—I am in receipt of your esteemed favor of November 11th.

The criticisms of the *World* in reference to my lecture passed without notice from us, because I saw that the writer did not understand the subject he criticised and was confounding things.

There are many substances which in the act of solidification assume a crystalline form which demand more space than is occupied by the same body in the liquid state. Water proper more than any other body assumes this altitude, and it appears that the molecular rearrangement which really results in ice commences in the liquid a few degrees above the freezing point, and continues previous to the act of solidification.

This altitude which is so signal in water I must ever consider,

in spite of the views of those who would discredit all evidence of design in God's works, as one of the most remarkable evidences we possess of the adaptation to our need. We must in all our reasonings upon natural phenomena be very careful to keep within the domain and control of facts. Thus your speculations as to "the bubbles escaping from water in the act of heating as of freezing" are air rarefiable, because chemical analysis proves that they are air and nothing else; and we aver that all natural waters contain air. So also your speculations as to the bursting of the bombshells by heat. The expansion of the water in becoming ice is sufficient to account for the phenomenon. And there is not a particle of evidence that ELECTRICITY has anything to do with it. It has long been a pack-horse to carry all sorts of burdens. But we have no occasion to call it in for this case.

I trust you will excuse my frankness and the brevity in which I am compelled to state the general principles and in order so as not to obscure my meaning.

Yours respectfully,

B. SILLIMAN.

RESPONSE TO PROF. SILLIMAN.

GENEVA, N. Y., Nov. 29th, 1869.

PROF. SILLIMAN, M. D.:

Your communication of November 22nd was received, for which you have my hearty thanks, and especially for your criticism which I have read with great attention and interest. If my theory is true it will come out all the brighter by being sifted—if not, let it crumble. I am very sincere in my views, notwithstanding. If I err in opinion, I hope it may never be accepted. I am at all times truly grateful for criticism; it affords me an opportunity of looking myself over, of mending and repairing. It is not those who concur with me in opinion who strengthen me, but those who show to me my weak points; it is such who aid me most. And if your criticisms have not yet convinced me that I err in my reasoning, they show me that my points have not all been clearly defined; one in particular which has not escaped my observation, though I have neglected to state it. It is in regard to the expansion of water upon the surface a few degrees above freezing (so said). I claim that freezing has already commenced even before the surface has assumed a solid mass. There are little particles of ice which float and chill the fluid in its immediate vicinity, also adhere to it and prevent its sinking.

Again; the only proof I have to offer that the bubbles, supposed to be air, are water, is their condensing into vapor; that I had in my previous article alluded to. In your reply to me you did not state what you thought of my view of india rubber. I trust, with more favor than my theory of ice. Before closing I must again thank you for your favor of the 22d.

I am by no means insensible to the fact that your time is much occupied and of consequence. Should you see fit to write me again I shall appreciate the kindness; even though it is criticism it will be thankfully received.

Very sincerely yours,

MRS. GEORGE HEMIUP.

THIRD LETTER TO PROFESSOR WHITE.

GENEVA, N. Y., Jan. 27, 1870.

PROF. WHITE, D. D.:

Not receiving an answer to my second letter, I have sometimes wondered if you had received it. You last wrote me from Wallingford, Vermont, and I directed my letter to the same place as you did not tell me where to direct. I am by no means insensible to the fact that your time is much occupied and of consequence, and I am truly grateful for your encouragement, and especially for criticism. Professor Silliman of New Haven, Conn., has ventured objection. Without flattery I say your inquiries are the only scientific objections, put in a scientific way, that I have received.

Prof. Silliman, in his criticism, tells me that "electricity* has long been used as a pack-horse for all sorts of burdens, but that we have no occasion to bring it into this case; for," he says, "in regard to your speculations as to bursting the bomb shells the simple increase of the volume of water by becoming ice is sufficient to burst the bomb shells, and we have no need of calling electricity in this case."

Once a fellow fired the contents of a revolver into the top of a tree and brought down a bird; whereupon his comrade *wisely* remarked, "you might have saved your powder, sir—the simple fall would have been sufficient to kill the bird." I am of the opinion that my waste of electricity is no more to be regretted on the one hand than the waste of powder on the other. We can all agree in regard to the result; but the question arises, what caused the result?

In my response to Prof. Silliman I passed the criticism without notice, for I could not reply to my superior in a sarcastic way, and I could think of no becoming way to treat it. I am of the opinion it was given after a hasty perusal of my article and without due consideration. Also, I believe him a conscientious person. However, I am by no means insensible to the fact that were my theory accepted it would place his lecture on the "Tea Kettle" before the American Institute in an awkward position. (The lecture has already received attention in these pages.)

*Not many weeks expired after Prof. Silliman's November letter to me before his associate, Prof. Norton, made use of *electricity*, and every other original idea contained in my theory, except that of the bubbles (I called water,) that he did not adopt.

PROFESSOR WHITE'S THIRD LETTER.

ST. LAWRENCE UNIVERSITY, }
CANTON, April 21, 1870. }

MRS. HEMIUP :

I owe an apology for not writing you before this; pressing duties, of a character often to preclude all thought of writing, must be my excuse. I cannot now enter upon a discussion as I would wish to do; but I have thought that perhaps some substitute might before long be found. There is to be a convention of philologists in Rochester. I shall attend if possible. I have a relative in Geneva, a Congregationalist clergyman now retired. If time permits I shall be pleased to call at your house, and in that case any views or criticisms may the more easily be exchanged.

In haste, very respectfully,

A. WHITE.

After attending the convention, Prof. W. arrived in Geneva at 10 A. M., leaving at 10 P. M., passing the time agreeably in conversation on the subject of science with the exception of one hour given to his relative. I inquired what he thought of my theory of india rubber. He responded heartily, "It is all right: it agrees with my previous view of the subject."

The correspondence and criticism that grew out of the publication of my theory accasioned me to write more extended remarks, carefully defining my position by quoting each and every criticism that had been brought to my notice, and under each criticism placing a concise and plain answer. These answers, together with my india rubber theory and ice theory (the printed article,) were sent to various scientific societies. In but one instance were they returned to me or acknowledged. In this instance they were directed to a woman, as follows:

GENEVA, N. Y., August 15, 1870.

MY DEAR MRS. WILLARD:

Being at some loss to know to whom I should direct my manuscript so as to have it considered and tested in the convention about to convene in Troy, I have decided to send it to you.

Respectfully,

MRS. GEORGE M. HEMIUP.

Received the following in response from Prof. Olin:

TROY, 27th Aug., 1870.

MRS. HEMIUP:

Madam—Mrs. Willard desires me to return you the enclosed article, to say to you that it was contrary to the rules of the Scientific Association* to consider printed matter, and therefore it could not be brought before them.

Respectfully,

S. L. OLIN.

*But part was printed matter, the rubber theory and other matter being written.

CHAPTER VII.

ELECTRIC YEAST.

May fifth, eighteen hundred and sixty-six, a woman stirred up a new kind of electric yeast in a very small cup; she stirred it with her pen until it rose to the brim; then she knocked at the doors of science: 'Please try it,' she said; 'it is so very new.' But WISE SAGES shook their heads and decided 'we will not test this woman's yeast in our convention—we take about the same kind of interest in a woman's scientific attainments that we do in a large head on a very small boy.' However, they thought it worth their while to look into this matter of yeast in a private kind of a way. It is only a crude material, but it may possibly be turned to some purpose or use; in the economy of nature nothing should be wasted. Behold! In eighteen hundred and seventy a scientist brings out an old and hard loaf—it was made long before—and served up on the table of the *American Journal of Science*, and in the London Philosophical Magazine (entitled *Molecular Physics*.) It was publicly served, but no scientist on either continent dreamed that one day it would be so improved as to explain in any way "the deviation of water from the general law" of expansion and contraction. Although it had long been on the table of science it had never been baked in the scientific oven. It lacked rising qualities, and baking it would only place the loaf in a harder and more insoluble condition. In Silliman's *American Journal of Science*, in eighteen hundred and seventy, in the January number coming out the last of the month, the old loaf is again served with additional dress. "I now find," says W. A. Norton (Prof. Silliman's associate in Yale College), "no additional hypothesis is necessary." But behold! He puts just a spoonful of the woman's yeast into the old loaf! Now look at the result! It begins to rise! But the rising qualities appear to only

come up in spots—it is a bad mess after all. The yeast does not possess chemical affinity for the old loaf, and there are a great mess of hard lumps that will not assimilate with the yeast. The loaf has now assumed or become a conglomerate mass of contradiction and inconsistency; it is long drawn, patched and plastered with ambiguous words and meaningless phrases.

But scientific bodies are thinking favorably of the loaf notwithstanding the dry lumps. If they bake this loaf in the scientific oven it must be done slightly—a thorough baking will separate the lumps from the yeast, and the old loaf will crumble to pieces.

The theory of little particles of water rapidly condensing into ice causing friction, thereby exciting electricity to heat and expanding the centers of those particles and throwing off invisible vapor from each center, leaving only the shell to float, can never be absorbed into any old musty theory of gravitation. No amount of sophistry can cement this theory of expansion with any other theory. It must be either accepted or rejected in whole. It is built upon the supposition that the bubbles supposed to be air are expanded water with all its parts—that is the corner-stone of my theory, and if true must sooner or later be acknowledged.

Writers on physics, the same as attorneys-at-law, when they have the facts on their side stick to the facts. But when the facts are against them attorneys talk around them. Writers do the same, only a little more so—they expand into the ethereal. The expansion of their thoughts transcends the invisible matter of God's universe, for the invisible matter in nature can be again condensed so as to be visible. Not so with these invisible reasoners; their thoughts can never be condensed into solidity.

I will transfer to these pages one of the spots of yeast that looms up very conspicuously out of the mist of W. A. Norton's invisible reasoning on gravitation and "molecular physics:"

"THE EXCITATION OF ELECTRICITY BY HEAT IS CONCEIVED TO BE PRINCIPALLY DUE TO THE EXPANSIVE ACTION OF HEAT ON THE ELECTRIC ENVELOPES OF PRIMITIVE MOLECULES, AND ON THE COMPOUND MOLECULES, WHICH EITHER SETS FREE A CERTAIN PORTION OF ELECTRIC THERE, OR ESTABLISHES A CHAIN OF ELECTRO-POLARIZED MOLECULES."

Here you see my theory in a nut-shell with the exception of the (center) that is thrown off through the influence of electricity that is excited to heat by condensation and friction (with him is ether.) I assume the center is water, and A. W. Norton calls it ether. Now this is suggestive of the boy who copied the answers wrought by another pupil without copying the process through which the answers were obtained.

Now in case we admit that all water contains air—as Prof. Silliman and his associate, W. A. Norton, aver—there is no use of adopting the other portion of my theory in view of harmonizing the law of expansion of ice, for all will see at a glance that air is lighter than water, and by “setting the ether free,” the lighter portion of water, the opposite result would most certainly be obtained.

Again; even though he adopts my theory of electricity, it appears quite beyond his comprehension after all the explanation I gave in my letter to his associate in Yale. He understands there is a shell, but he don’t appear to understand how it came about. “THE EXCITATION OF ELECTRICITY BY HEAT,” he says, “IS CONCEIVED TO BE PRINCIPALLY DUE TO THE EXPANSIVE ACTION OF HEAT ON THE ELECTRIC ENVELOPES,” whereas if this was the case the shell would melt in place of the center being set free. Any person with common sense can understand that electrical heat on the shell would have the opposite result from condensing; hence, where would be the condensation and friction necessary to set the center free? It is because the water (the center) has been set free that the ice floats.

After the publication of my theory many learned men were struck with its originality. While all did not decide at once in regard to its acceptance, they were unanimous in pronouncing it original. Among the number I may name Prof. John Towler formerly of Hobart College—since U. S. Consul at Trinidad.

CHAPTER VIII.

CHEMICAL EXPERIMENT.

At Linden Hall in 1868, I was much interested with Prof. John Fim's experiment with metal. After expanding it by heat he remarked: "You see nothing there; the strongest glass you can bring to bear upon it will reveal nothing more. It is the same as you see upon your lake while freezing, only you see it condensed."

Now that is something (the condensing) that we see without the aid of instruments. Hence this is a matter that is carried beyond scientific instruments—reason alone must suffice. Here is an illustration of the fine work in nature—its superiority over the finest instruments that man can bring to bear upon it.

The latest date that I offered my theory for consideration, or addressed any person in regard to the subject, was January, 1871. At that time I submitted my papers to Prof. E. Pickering of Boston, and received the following acknowledgement:

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
PHYSICAL LABORATORY,
BOSTON, Feb. 18, 1871.

DEAR MADAM:

I have read your article on the formation of ICE, but must admit that it does not seem to me conclusive. You will find either of the following books much better on the subject of heat than Wells' Philosophy—heat as a mode of motion. "A Treatise of Heat by Stewart." "Chemical Physics by Cook." In either of these books I think you will find certain phenomenon which cannot be explained by your theory, such as the permanent expansion of water or ice, which by your theory should be only temporary.

Again; steam cannot be generated by cold, or its high temperature would at once warm the water. Our knowledge of electricity is so good and our means of detecting it so complete, that if generated as you suggest we should have easily found it with electrical instruments.

Respectfully yours,

EDWARD C. PICKERING.

This observation is now claimed for experimental science—called Maxwell's theory of gases.

In regard to instruments I find in "Buckle's History," published 1873, (on page 123,) "The extremely imperfect state of the *SP* microscope which even now is so inaccurate an instrument that when a high power is employed little confidence can be placed in it; and on examination, for instance, of the spermatozoa has led to the most contradictory results."

Professor Pickering also observes: "Such as the permanent expansion of the water or *ice* which by your theory should be only temporary; again, steam cannot be generated by cold or its high temperature would at once warm the water."

Professor Pickering expressed this view of the matter and with some reason, as we learn by Professor Boussingault's experiment in the *Academie de Science* of Paris. "He took an exceedingly strong steel cylinder, placed in it a small steel bullet and filled it entirely with water at 4° C. The cylinder was then closed by means of a cap, so that it was absolutely tight; the cylinder was exposed to a temperature of 24° C. for some time, but the water inside was not frozen, as was proved by the mobility of the bullet in the interior. Immediately on opening the cylinder and relieving the pressure the water became a mass of *ice*."

Professor M. Boussingault's experiment in the year 1872 was a grand vindication of the truth of my theory of 1866. Electrical heat was germinated by condensation and friction, without equal power of escape, and the water remained a fluid. The theory of heat I have advanced, and none other, can explain reasonably the cause of this phenomenon.

CHAPTER IX.

ICE SANK.

The following quotation is from the *Geneva Advertiser* of May 25th, 1886:

"Some few years ago it will be recollected that a thick body of ice remained upon Seneca Lake extending for nearly two miles from the northern beach. One morning, late in the spring, a fisherman—and we think it was Edward Cole—walked from the long pier straight across the lake and returned with an evergreen brush in his hand. The next morning not a particle of ice was to be seen—the ice sank. The singular event was recorded and published at the time.

"Now we shall be glad if any of our readers can name the day, month and year. It is for a special purpose. We have questioned several old lake men about it, who remember the occurrence, but not the precise date. Our impression is that it occurred in 1865, and that it was the 14th of April that Mr. Cole crossed the lake. In connection with it an argument arises that *ice* does not sink, and a well known writer takes the position that under certain conditions *ice* will sink. The writer (a lady) wants the dates, for she also has recollections of the occurrence.

"The files of the *Gazette* having been burned in the fire of 1871, we cannot fall back on them. If any one is positive as to the day and date, let him or her please inform us for the next issue."

I learn by the above that the editor of the *Advertiser* has very kindly set about assisting me as to the positive date. I will here add that this incident is not the only occurrence of the kind that has transpired within the memory of the middle-aged inhabitants of Geneva. Some time about the year of 1857, late in the spring, the day following a horse race on Seneca Lake, the ice

sank. The same phenomenon in regard to ice on other lakes has been observed. The sinking of ice is considered so remarkable as to be discredited by those not in possession of actual proof of the fact; but it is nevertheless true.

The phenomenon is consonant and harmonizes with my theory of ice. Under a warm sun for a succession of days each crystal in the mass is softened and penetrated from the upper side, and the centers of the crystals as the top becomes softened fill with water. This work commences with the surface ice, and if the water remains quiet and the sun continues to penetrate the ice crystals, each successive layer of the mass of crystals will fill with water the same as the first. When the ice crystals or apertures are thus filled, then in conformity with the general law of expansion and condensation the ice sinks; the center of each crystal being filled with water thereby renders the ice heavier than water, affording another proof in sustenance of the view I have taken in regard to the first cause of ice being rendered light because portions of water had passed out in an expanded form. In this instance water is returned to the apertures, the voids are filled, and the ice sinks to the bottom of the lake.

This phenomenon can only be produced under a penetrating sun for a succession of days and in exceedingly quiet water. Wind or motion of water causes ice to melt in the usual way; each layer of crystals from under are washed away as they become softened. It is only a slow process of melting under a penetrating sun and in still water that can produce the first phenomenon.

It is for this reason that this same phenomenon so often occurs at the White Spring farm, two miles from Geneva.

The editor of the *Advertiser*, since the issue of his paper from which I have quoted, has gleaned the following: "A Mr. Clark and others have seen the ice sink to the bottom of the White Spring—it is a common occurrence there."

This spring or pond is very clear and quiet water, having no great depth; in winter it often assumes a very thick crust; from its elevated situation it is exposed to the cold blasts of winter, and in the spring it is penetrated by the warm sun; hence the result already described.

Another article has just appeared in the *Geneva Advertiser* (June 8, 1886,) corroborating statements of former articles in the

same paper in regard to ice. I cheerfully submit to these pages the contribution:

ABOUT THE SINKING OF ICE.

"We have a letter from a lady in Florida, giving the precise date of the sinking of the ice in Seneca Lake. It was on Sunday, the 10th or 11th of April, 1857. Certain local incidents which she names, and about which there can be no mistake, place the date fixedly in her mind.

"On that Sunday morning I walked to church with my father. The grass was green, the robins were singing in the trees, yet the lake was covered with ice. During the sermon a tremendous explosion was heard, apparently at the lake, and many left the church supposing the old 'powder magazine' had exploded, perhaps with dreadful results. When we retired from church, not a vestige of ice was to be seen, and the lake was as clear and beautiful as could be.

"Mr. Thomas D. Burrall, who was then residing opposite Trinity church, told my father that not feeling very well he had not gone to church that morning. He took a stroll down his garden, and stood and looked upon the lake, its surface covered by ice, and thought how remarkable it was at that season of the year. He turned to look at some crocuses back of him, and at this instant he heard that loud report as of an explosion, and when he again looked toward the lake every particle of ice had disappeared.

"There were many articles in the New York papers at the time in regard to what had become of the ice. One thing is certain—it *was gone*, and within a space of five minutes.'

"These facts, and others mentioned in the letter, in our mind establishes two things: First, that the sudden disappearance of the ice was in the spring of 1857; second, that the ice did not float away, but disappeared suddenly—it sank: and Mrs. George M. Hemiup is firmly entrenched in the position she has taken in the theory upon which she is extensively writing, but with which she has met strong opposition from learned men, professors and scientists."

In the last statement the editor is somewhat mistaken. The theory has seemingly met with no opposition whatever, except in a

single instance; in every other, so far as heard from, the theory has been declared worthy of consideration; the only difficulty it has had to contend with is piracy.

The editor of the *Geneva Advertiser* asks my opinion as to "what occasioned the report, supposed to have been a magazine explosion at the time the ice suddenly sank in Seneca Lake?"

Be it remembered the phenomenon occurred on a beautiful Sabbath morning—not a breath of air stirring.

The Saturday previous there had been a horse race upon the ice, proving the great strength of the ice. These facts are to be taken in connection with the reasons that I have already given for the ice suddenly becoming heavier than water; the icy covering or crystals were penetrated by the burning sun from the top, and thus softened, their apertures filled with water, thereby rendering the mass of ice heavier than water.

Had the entire shore been perpendicular which encircled the ice, when it began to settle, the mass of ice would have turned gradually to one side and gone down edgewise, giving no sound except that of a sudden plunge—but it was otherwise.

The margin of the lake being shallow the land on the shore offered resistance; and when we consider the tremendous weight of a body of ice that covered an area of at least three square miles, and this weight augmented by water resting upon its surface as it settled and touched the low land around the margin of the lake—the great weight bearing upon the center—I think is sufficient reason to occasion the main body of ice to break in the center—hence "the terrible report that so alarmed the worshippers in Trinity church that some of them rushed out of the church, believing there was a magazine explosion."

When the ice broke it evidently went down edgewise from the line of its rupture.

CHAPTER X.

INVISIBLE VAPOR.

The fine work of nature transcends the finest instruments that man can bring to bear upon it. Water expands into invisible vapor and rises above the air that surrounds it without changing or losing a particle of its constituency. After a time it condenses and returns, and it is then visible to the human eye.

I am impressed that the phenomenon of water expanding so as to be invisible under the strongest glass that can be brought to bear upon it may have led to a grand error in regard to its constituency, many other other errors growing out of the first. One mistake, at first though small it may seem in the domain of science—the same as a mistake in figures leads to confusion, and no amount of reasoning on the one hand or figures on the other can rectify a bad beginning—there is but one way to triumph over the confusion, and that is to wipe out the first grand error, the parent or cause of a long train of contradictory results.

I read a newspaper article not long since (having lost the article, must draw from memory,) wherein a traveler in Canada described the appearance of a northern river while freezing under a severe Canadian temperature. During the night flashes and waves of light covered the ice, accompanied by continual noise—a murmuring, rumbling sound like distant thunder. Other writers of other times have described similar phenomenon. In a number of "Nature" (an English journal of science,) in the year eighteen hundred and sixty-two, a correspondent describes the same phenomenon during the freezing of the Ottawa river.

There is evidence on every hand in support of the theory of electrical excitement and heat due to rapid condensation of water. This theory explains the thunder storm in a summer sky. By assuming that like causes produce like results, we can carry the

theory of electrical heat due to condensation of water into the clouds. Under a burning sun water expands and rises into the regions of cold atmosphere—is thereby suddenly condensed into ice crystals (snow and hail); when it ascended it was lighter than the atmosphere that surrounded it. True to nature, by cold it is again condensed and descends to the region of its starting point. In falling to earth (before reaching its destination) under the sun's influence of heat, intensified by its own motion, the snow melts and assumes the form of rain; hail in view of its increased size reaches the earth in a solid state.

It will not require any large amount of fancy or speculation to understand the cause of lightning due to condensation in a summer sky.

CHAPTER XI.

GLACIERS AND SNOW-CAPPED MOUNTAINS.

Now I have something to say in regard to glaciers and snow-capped mountains. "How are the glaciers formed; and how are the mountains clad with snow?"

Although I have determined to speak my mind frankly in regard to my convictions of truth, it is not without hesitancy: but my ICE theory is already on the way, and the propelling power—~~steam~~—it cannot rest until it has traveled over the glaciers and ascended the highest peak of the Alps. I do indeed feel hesitancy in attacking doctrine promulgated by such solid men as Professor Tyndal and his associates, and cannot go further without first defining my position.

I will endeavor to illustrate my position, and show the right of an inferior to criticise a superior, by relating an anecdote of a country "greenhorn." An artist high up in his business, whose work was of a superior order, painted a litter of pigs together with their mother eating out of one trough. Their forms were perfect, the general expression so life-like as to excite general admiration and astonishment. But the author, possessing noble qualities due to his profession, fully realized he would be more profited by criticism than by the flattery of friends; therefore he placed himself in an unseen position and listened to the remarks of visitors in the art gallery. For days all manner of praise was showered upon his beautiful work; all declared it without fault or blemish. But one day a "country greenhorn" took his stand in front of the picture, with mouth and eyes wide open. "By golly!" he exclaimed, "who ever before see an old sow and a dozen pigs all eating out of one trough and none of 'em have their feet in!"

Although the criticism did not emanate from an artist, the noble artist recognized the justice of the criticism all the same.

My case, in some sense, may be parallel with the "green-horn." A woman over whose head half a century has rolled—the customs in the time of my childhood because of my sex placed a chasm between me and science. It is but recently that a poor plank has been laid over the chasm; it is not yet a respectable bridge.

How are the glaciers formed? and how are the mountains capped with snow? Here I find it practicable to quote from Professor Tyndal's interesting and instructive work on "Clouds, Rivers, Ice and Glaciers."

"The cold ice of the Alps," he says, "has its origin in the heat of the Sun. By heating water we first convert it into steam, and then by chilling the steam we convert it into clouds. But the fire of Nature which produces the clouds of the atmosphere is the fire of the Sun. We thus trace the river from its mouth to its source, and come at length to the Sun.

"There are rivers, however, which have a different source from those just described. They do not begin with the drippings on a hillside, nor can they be traced to a spring. Go to the mouth of the Rhone, for instance; follow it backwards to Lyons, where it turns to the east; trace it through the lake of Geneva; you finally reach a huge mass of ice which fills the Rhone valley, and from the bottom of which the river rushes. In the glacier of the Rhone you thus find the source of the River Rhone. But we have not come to the real beginning. You soon perceive that the earliest water of the Rhone is produced by the melting of the ice. If you go upon the glacier, and walk upwards on its surface, after a time the ice disappears and you come upon snow. You soon learn that it is the mountain snow which feeds the glacier. By some means or other the snow is converted into ice.

But whence comes the snow? Like the rain it comes from the clouds which have been raised into vapor by the heat of the Sun. Without solar fire we could have no atmospheric vapor; without vapor no clouds; without clouds no snow; without snow no glaciers; or without the Sun no ice."

Professor Tyndal very consistently reasons that during the day the sun's heat softens and melts the snow on the Alps. This occasions water to drip down during the day upon the glaciers—all of which we have no reason to doubt.

But, I am impressed, that beyond the softening of the snow and the dripping of water, the Sun's agency in the formation of glaciers herein ends and its power ceases. But if the Sun is not the agent which formed the snow, from whence comes the snow? Let us see. It is but right we first listen to Professor Tyndal and consider the subject in all its bearings; his views are entitled to a first consideration:

"Where the vertical sunbeams strike the land they heat it, and the air in contact with the hot soil becomes heated in turn, and consequently expands and becomes lighter. This lighter air rises, like wood plunged into water, through the heavier air overhead. When the sunbeams fall upon the sea the water is warmed, though not so much as the land. The warmed water, which has become lighter by expansion, continues to float on the top. This upper layer of water sends up a quantity of aqueous vapor, which being lighter than air helps the latter to rise. Thus both from land and sea ascending currents are established by the action of the Sun.

"Having reached a certain elevation in the atmosphere these currents divide and flow part towards the north and part towards the south, while from each quarter a flow of colder air sets in to supply the place of the ascending warm air. Constant circulation is thus established in the atmosphere.

"The equatorial air flows above towards the poles, while the polar air flows below towards the equator. But before the air returns from the poles great changes have taken place. The aqueous vapor with which it was laden as it left the tropics could not subsist in the polar cold, and was then precipitated in the form of rain, or more commonly of snow. The land near the pole is covered with this snow, which gave birth to glaciers of stupendous magnitude."

The question again comes up, from whence all this snow if not from the clouds? If borne from a distance by winds, would not the same force that brought the snow from distant regions sweep the mountain top and precipitate the snow into the valley beneath?

I am impressed that we must look for a more powerful and subtle agent than the Sun as a vehicle for conveying vapor to the summit of the Alps. In the prevailing winds from every direction

to which the mountain heights are continually subjected, I am persuaded that a hundred times more snow is precipitated into the valley from the mountain top than is brought by the wind or descends upon the mountain from the clouds. We have illustration of this suggestion in the streamer cloud from an Alpine peak. The formation of cloud on the Alps "is often connected with a singular phenomenon—a streamer of cloud many hundred yards in length drawn out from an Alpine peak. It appears to be perfectly steady, although a strong wind may be blowing at the same time over the mountain-head. Now this permanence is only apparent, and the cloud in fact is blown away."

In this phenomenon of the streamer cloud we have unmistakeable proof of snow in vast quantities being continually swept away by the same winds that are supposed to have deposited snow upon the mountain; hence from whence came all the snow that supplies the streamer cloud if neither brought by the wind or produced from water evaporated by the Sun?

Be it remembered that, in spite of the "Sun's fire," it is much colder on the Alpine peak by day than by night; also, much colder in the valley by night than on the mountain summit. In view of these facts we must look for other cause than vapor produced by the Sun's heat. I think we have unmistakeable evidence of the opposite result. In the phenomenon of vapor shall we not recognize a hidden force—a heat of mighty power—the same that I have traced in these pages all along, due to condensation and friction—the colder the temperature the more rapid condensation, thus intensified heat?

In Professor Boussingault's experiment we have observed this subtle heat; when confined it was capable of holding the water a fluid notwithstanding the heat that was naturally conducted off through the steel cylinder, as well as the cold temperature of 24° C. that was brought to bear upon it; in defiance of all this it remained a fluid.

Now shall we not consider this the power of heat that renders the temperature of the mountain-top milder during the night than in the valley? During the day the sun softens the snow and causes water to drip down from the mountain on to the glaciers. By day

water that descends (from whatever cause) during the night freezes. In the process of freezing, each nightly occurrence adds an additional layer of ice upon the glacier.

But, this is not all; in the process of freezing each crystal sends out from its center invisible water expanded by electrical heat, due to condensation—its heat so much more powerful than the sun as to render the otherwise naturally cold air upon the mountain top at night milder than that in the valley. Severity of temperature increases the rapidity of condensation, thereby intensifies the electrical heat and augments the momentum of invisible vapor as it moves from its countless prison cells. How far it ascends in a single flight is beyond the means of human agency to demonstrate; but from the amount of snow that I think finds its way upon the mountains from this cause, it appears to take a long flight at the first bound.

CHAPTER XII.

VITAL FORCE.

In water and ice I have discussed the phenomenon of heat, due to condensation, step by step, in its manifestation from the simple freeëzing of a lake or pond to the Alpine peaks, and thence to the river glaciers, and so on to the water that flows in the River Rhone.

Thus far I have discussed the principle of heat in but one of its phases; but now propose to examine the principle of heat in a broader sense. In order to do this, it will be practicable to commence at the foundation of heat, its first beginning, its life.

In Stockhard's "Principles of Chemistry," "heat is the result of motion." After a careful examination of the subject of the origin of heat, I am thoroughly convinced that Professor Stockhard is entirely correct in this statement. It is a truth that no amount of sophistry can upset.

In tracing the law of heat I have decided to advance but one step at a time: "To prove all things, and hold fast that which is good." In the discussion of heat, the first step towards advancement in the way of intelligent understanding of the problem is to put aside the meaningless phrases and ambiguous language that have so long encumbered it. If heat is the result of motion we have no use for "latent heat." No one will assume for a moment that there is such a thing as latent motion. We cannot hold to the term "latent heat" and reject its parent or cause—motion; to do so renders the term "latent heat" illegitimate. The relation of such language to the principles of heat is consonant with barnacles that adhere to a ship, thereby retarding its progress.

We go out and view a conflagration, and are constrained to say this heat, this fire, is the "mode" (or cause) "of motion." What a mighty element of force is heat in moving buildings from their foundations and levelling them to the earth! But let us go

back to the commencement of the conflagration. A small flame was kindled at first by drawing a match against a piece of flint; this motion produced friction and heat, that was applied to a tallow-dip, and from thence originated the conflagration.

We will now leave the conflagration and go out on a clear, cold, winter morning to examine the woodman's axe. While he is taking off his coat in preparation for work, we lay our hands upon the axe; it is very cold; we would not like to lay a damp hand upon it lest it adhere by means of frost. Now the woodman commences with well-directed blows to hurl with violence the axe into a log of hard wood: blow succeeds blow in rapid succession. While we stand shivering in the cold great beads of perspiration start from the woodman's brow. While he stops to wipe the perspiration from his face we advance and again lay our hands upon the woodman's axe; we draw them back for the axe is now uncomfortably hot. What shall we say in this case? Was it heat that preceded and caused the motion? Or was it motion that preceded and caused the friction and heat—occasioned the cold axe to become warm, as well as motion that brought perspiration to the woodman's brow?

It is not necessary to dwell at great length on this part of my subject, for it could be continued in the way of illustration forever, in view of the fact that motion precedes all heat. The illustrations that I have introduced as evidence neither requires the aid of scientific instruments, or even a fine delineation of reason to establish the fact that motion precedes heat. The result of these manifestations must be apparent to the most superficial observer.

But there are subtle forces the workings of which we can not see with the human eye, although aided by the most ingeniously constructed scientific instruments. The dampness, the vital action, the grain that was stored in large quantity; we could not see the subtle force of damp move upon the vitality of the grain and produce heat; but can we doubt these forces of action of matter upon matter produced the heat?

So far as I am able to observe, heat is excited by two opposite motions. The sun gives motion that kindles the vital spark, expanding the acorn; motion continued, the oak. This impulse is that of love.

The conflagration was set to work by the motion of resentment.

The motion of love builds up and the motion of resentment tears down. Each is the same force acting from different impulse. One is the vital force of love; the other is the vital force of resentment. The vital spark itself is heat (called electricity) that pervades all space—the Grand Vital Force—and is subject to both love and resentment. Heat due to condensation is the force of resentment, friction, the same as heat is due to motion, (the impulse of resentment.)

By following the simple law of heat and tracing it carefully in all its known phases and leaving out speculation and guesswork, simply dealing with demonstrative facts, the doctrine known as “Nebular Hypothesis,” that is supposed by many to have upset the Bible, is itself upset, thereby taking for the basis of our argument that heat is the result of motion.

CHAPTER XIII.

NEBULAR HYPOTHESIS.

Without motion, before God had moved upon invisible matter, it was cold and inanimate. Without the Grand Vital Force (electrical) imparted by an Omnipotent Power, there could be no motion, hence no heat. Invisible matter could not even condense into nebular clouds without God to move it. Even though it were a cloud matter, thus spread out into ethereal space, it must have remained cold matter. Even though there was a Sun, with all this cloud matter the Sun was not made for the earth—its warm rays could not penetrate the clouds. Without God to move it, this cold and inanimate matter was very unlike the cold that we know; as for instance, in cold water and even ice there is a God-given power and force; when very much crowded it moves by its force of resentment and produces heat—a wonderful and powerful heat it is, too.

We have seen it illustrated by Professor Boussingault's experiment of water in a steel cylinder, exposing it to a temperature of 24° C. it remained a fluid so long as confined in its narrow quarters, but on removing the pressure the water became a mass of ice.

On strictly scientific principles we have every reason to believe that the Earth was formed from an invisible matter, and to assume or believe that it was anything but cold and inanimate until the Spirit of God moved it is unscientific. Even now, in our own time, the Earth—an acting, moving force with its own vital heat—with a clear sky, under the Sun's influence, all these forces combined, boiling fluids expanded into steam and drawn up and spread into space instantly become cold.

At the Equator under a burning Sun, in the extreme heat, mountains of any considerable height are continually clad with snow. Now, with all the solid matter the Earth contains together

with its fluids, who will have the presumption to say it would not if expanded into nebular matter extend into space above the highest mountains; who can compute the millions of miles it would extend beyond those mountains? Is there any law known to science that can explain why matter thus spread out would not suddenly become cold? And yet scientists ask us to believe that for ages, thousands upon thousands of ages, matter thus spread out steamed, burned, hissed, smoked, boiled, commotioned. How it ever under these circumstances came together is difficult to comprehend by this reasoning. As near as I can understand their molecular process, one little molecular moved on another little molecular, another little molecular moved on another molecular—thus continuing. Well, by this molecular process, without any God, we cannot wonder that it took vast ages to build this grand Old World on which we reside.

Scientists who are inclined to believe that matter thus spread out into space in the ethereal region ever retained a high temperature for vast ages are very respectfully invited to consider the following facts pertaining to Mount Washington signal office*—a building with double walls, filled with sawdust; double windows, double doors and double floors. Large iron rods run through the house and are bolted in the rocks beneath; while two heavy iron cables are thrown over it and fastened on each side. In the coldest weather the only habitable place is the center room which is only twelve by fifteen feet in dimensions.

“Two stoves of the best make are run at their full capacity, and by wrapping themselves in blankets the observers just manage to keep themselves from freezing.

“The stoves occupy nearly half the space in the room, and yet water will freeze in this room in a moment.

“The noise made by the wind is indescribable. It comes at short intervals, and sounds as if an army was pounding at the door with a battering ram.

“No human creature could live for two minutes exposed to such a blast. Even in August water in this room freezes solid.

“Everybody has seen frost on windows and knows how it looks; here it forms four or five feet thick, and if a person goes out it will deposit a foot deep on his clothes.”

*Gleaned from the *Chicago Times*.

The question comes to us, why does cold increase in temperature as we ascend into the more elevated regions? We observe that even the Sun's heat fails to warm matter that is spread out into space. Although cold predominates on Mount Washington, we have evidence of a strong force of heat, otherwise there would be no wind; if there were but one element peace and quiet would prevail.

If we doubt there being an element of heat where cold predominates because we can neither see or feel it, we can look at the two large stoves in the signal office at Mount Washington, running at their utmost capacity, the fire bright and glowing; yet in this small room, protected from cold so far as the ingenuity of man can invent or contrive, water in this room freezes in an instant. If the heat of two large stoves thus confined in a small apartment of only twelve by fifteen feet is counteracted by cold so as to be imperceivable, therein we can understand how a vast amount of heat on the outside, where there is no protection, would be imperceivable except as a disturber of the elements.

By careful observation I learn that heat can only be generated by the motion of matter with matter in close companionship; the impulse of either love or resentment are only brought into action by partnership and the most intimate association of matter; as for instance the force of resentment, (the match against the flint.)

Matter in companionship is moved and warmed by the Sun; thus the vital spark is kindled by the impulse of love and produces the plant. The force of resentment is the vital force offended. Each of the motions produce heat but are actuated by opposite impulses; the impulse of resentment tears down and destroys by conflagration, or emigrates to ethereal regions discarding intimate companionship until it is cold.

Mineral substances are less impulsive than fluids. Water is never at rest; it moves, emigrates, pursues congenial climes. When subjected to high pressure of heat it ascends into lofty regions until cool; when cold it descends and is again brought into warmth and close companionship, the same as before.

CHAPTER XIV.

EARTH'S GRAND VITAL FORCE.

The earth is not flesh, hence it is not an animal body, although the substance of all flesh is manufactured and converted from the earth; flesh is peculiar to creatures who think.

We recognize in each vegetable, plant or tree vital force peculiar to its kind; at the same time it is under the authority and dominion of the Earth's Grand Vital Force.

The earth never yields its claim upon matter—in this it is unrelenting. There is not a creature that walks upon ^{earth} ~~its~~ face who is not continually reminded of this claim and rendered weary by a constant drawing.

This force has a great variety of names. Observe the tree: its sap ascends into the branches and top through arteries; the force that carried it is named "Capillary Attraction;" the force that holds it together is named "Attraction of Adhesion;" although they are one and the same force (vital.) By and by a worm eats at its heart; the tree dies, goes into decay, its ashes lay helpless upon the earth's bosom, where it is warmed by the sun and watered with summer showers; its independent attractions are lost; they are turned to new phases, assuming new relations, but all the while subject to the Grand Vital Force. By this force all matter is drawn together, but the mineral substances by means of their stability and solidity when brought into union with each other are more constant in their affinity and adhesion.

Minute creatures which live in the blood of animals have inherent a central force of locomotion, and are as wonderfully constructed as the elephant, notwithstanding they are subject to another force; as the blood courses through arteries to and from the heart, they are swept and drawn by its influence. Their opportunities for studying the mechanism of the large body in which

they live and receive nourishment are limited; their observations cannot extend beyond the arteries. If by chance they incline to philosophy, and love delineating the sentiments of nature by careful investigation, it will not be surprising if they calculate that the drawing quality to which they are subjected as the blood of the large body performs its revolution to and from the heart is an attraction, and the only force the body in which they reside possesses. These minute reasoners could scarcely be expected to comprehend the fact that so large a body could be so wonderfully formed, and especially with power of locomotion superior or even equal to their own.

We must recognize God in the creation of force—not to do so is unscientific. By no means of ingenuity can we evade this principle, even though we go back, commencing at a small beginning, advocating the theory of progress. God's skill is just as visible in a blade of grass as in the giant oak. Just as much skill must have been brought into requisition in giving life to a fish as in imparting life to man. Is not the doctrine of evolution consonant with the theory of the earth's resting on the back of an elephant, and the elephant resting on the back of a tortoise?

While it is commendable for human creatures to admire and study the works of which they constitute a part, it is futile to attempt defining motion, except as we credit it to God.

CHAPTER XV.

THE PRIMEVAL MORNING.

When God moved upon cold, invisible matter, it was with the motion of love. Cold, inanimate matter suddenly drew into warmth and companionship; thereby natural laws were established in accordance with the same that are in actual force at the present time. Matter suddenly pressed together generated a tremendous heat! The Grand Vital Spark was kindled! Each element by its vitality drew to its own place and quickened into life—water separated from dry land.

The Earth's Grand Central Mechanism is beyond the investigation or comprehension of finite understanding, I doubt not; but at the same time I am not unmindful of a power and force surpassing finite delineation; however, revolving planetary movement indicates the existence of hot and cold brought in contact with each other; spiral rivers of fire coursing through rocks, under the ocean, and at great depth; in proximity and in the same rocks rivers of cold water winding down among the hot rocks circulating into the earth's warm heart. If this is really the case, the supply of cold water must naturally find ingress into the rivers from the ocean, creating maelstroms and egress by means of geysers and thermal springs.

With careful recognition of various manifestations consonant in nature I compute the forces of planetary movement are central. From the minutest creature, and so on up through all the ascending grades, there is a lineal and cosmical connection. The Grand Architect of all life spreads a pallor or shadow of obscurity over each piece of mechanism as it develops into view—within the mass of material in contemplation of the body, faint lines delineate and precede the embryo, but each line regardless of color is pronounced in its purpose and meaning. In the formation of a body

the constituents of each part find their own place previous to the hardening process of the solid parts which are to perform offices and constitute a part of the machine as well as propelling power.

When water was separated from land, on what principle of natural law now known to authenticated science could ages or even years have been required to bake the "fire-made rocks," especially with an Omnipotent Manager to superintend the fires? In accordance with the phenomenon of natural law, God, in bringing together matter through the impulse of love, caused the planet to quicken into life. The vital heat thus augmented by undue pressure also brought into action the force of resentment; by conflagration with its fires of resentment baking rocks, the "fire-made rocks," also warming, heating and expanding the water of the sea into vapor, thus returning it to ethereal regions—water thus recently separated from the land; this in obedience to law then established, and in accordance with the same as in actual force at the present time.

In "Genesis" we read, "there went up a mist from the earth, and watered the whole face of the ground." Hence the law of heat appears to have been the same then as now. Water when warmed went up in a mist into the ethereal regions; by this means it was then condensed by cold into water. A mist of great darkness must have covered the whole earth, vast mountains of vapor towering into the realms of space. In this event the grand electrical display at the dawn of our planet must have surpassed finite understanding. Excitement due to condensation of water of unfathomless regions must have brought forth from impenetrable darkness lightning flashes, darting chains crossing and recrossing each other at all angles; thunder following the lightning bellowed and broke in awful majesty, clap after clap came pealing forth, breaking thicker and faster in the midst of a grand coronet of electrical spears at all angles encircling and encompassing the earth. In the midst of this electrical display hail and rain fell in torrents upon the hot and famished earth, filling the rivers and ocean-bed with cold and sparkling water. All this while the natural elements combined—wind, water, lightning, thunder—reverberating through the vault of heaven in a grand and universal outburst in celebrating the birth of the earth. When cold water descended in sufficient quantity to fill the ocean-bed and the work pronounced good, flood-

gates from the sea opened communicating with spiral rivers winding their way among hot and "fire-made" rocks—the planet thus completed went whirling into space, a grand triumph in its way! Rain and hail continuing to descend and the artillery of heaven to celebrate the majesty of the occasion in the birth of the Earth!

If there were a Sun and Moon they were not yet made for the Earth. In this impenetrable cloud the Earth could not recognize the presence of the Sun, or be cognizant of her child the Moon. God thus dispelled the clouds and made the Sun to rule the day, and the Moon to rule the night.

Thus I have attempted delineating phenomenon of the Earth's forces, and locating the propelling power of one of God's grand revolving engines. Believing with all my mind and heart that the Earth's locomotion is due to rivers of fire on a vast scale, running under the ocean at great depth, where hot rocks hold in proximity rapid running spiral rivers of cold water fed by the sea, occasioning maelstroms—every part of the planet at work performing its duty in obedience to law—on the launching of this grand engine into space hundreds of craters belched forth with thunder and smoke, with no human witness to admire the awful grandeur of the occasion or tremble in fear of its power.

As we pursue this subject and progress, I think the reader will find that my theory of fire-rivers is in no way speculative, but on the contrary is founded on careful observation of actual phenomenon in connection with volcanic history. More than half of the Earth's active volcanoes, one hundred and ninety, are comprised in the volcanic belt which forms almost a circle of fire around the Pacific Ocean.

CHAPTER XVI.

FIRE RIVERS.

There are numerous evidences of connection between these volcanoes under the sea. By careful observations on the part of geologists it will not be beyond their domain to learn the route or nearly so of many fire rivers. We have strong evidence of a connection by such means between Iceland and Norway in the disturbances consonant one with the other. These co-operative disturbances are the more noteworthy when we deduce the fact that in Hecla's great eruption the geysers suffered little or no disturbance. In reference to this phenomenon in "Humboldt's Cosmos" he says: "The eruptions of the intermittent boiling springs and the slight change in the type of the phenomenon, are perfectly independent of the eruptions of Hecla, and were by no means disturbed by the latter in the years 1845 and 1846."

Be it remembered that during their disturbances the ocean in the vicinity was greatly agitated, while the geysers by their regularity of temperature and action illustrate the fact that they draw their supply of water from a channel far distant from their issue.

In regard to "physical change produced by earthquake, such as fissures," Humboldt says: "It is the more remarkable that so many warm mineral springs retain their composition and temperature unchanged for centuries, and therefore must flow from fissures which appear to have undergone no alteration either vertically or laterally. The establishment of communication with higher strata would have produced a diminution, and that with lower ones an increase of heat."

Is it not, indeed, remarkable that many thermal springs have never changed their temperature since the memory of man. Although located in the neighborhood of active and powerful volcanoes, they have stood the shock of earthquakes for thousands of

years without adding to or suffering any diminution of temperature. Through all these vicissitudes of ages their regularity and equanimity have never failed, but these faithful servants have kept right along performing their work with might and strength, never minding their troublesome neighbors.

If the geysers of Iceland were in any way connected with the volcanoes of the same island, as certain geologists would have us believe, they would long since have lost their identity, in view of the fearful convulsions and eruptions to which the island has been subjected. The island is quite noted for its remarkable volcanoes, especially Hecla and Skapta Jokul.

"In June, seventeen hundred and eighty-three, a torrent of lava flowed from Skapta Jokul filling up in its passage a deep ravine which the River Skapta had made, which was in some parts two hundred feet broad and six hundred feet deep, and then the bed of a deep lake. A few days later another fiery river burst out and rolled over the surface of the first lava. Continuing in its course further on, damming up streams and flowing continually for several days, it filled up a deep abyss which a tremendous cataract had hollowed; it continued its march of desolation with a stream seven miles broad and forty miles in extent. A few days later another stream flowed in an opposite direction, extending its flow for fifty miles. It has been calculated the matter poured out of this mountain in two months time would make a solid globe six miles in diameter."

Notwithstanding this disturbance the thermal springs held their equilibrium during this fearful eruption. During this period the sea was fearfully agitated for many miles. Inasmuch as the geysers have maintained their identity during such remarkable disturbances, I think we are warranted in accepting Humboldt's view, that "they are independent of the volcanoes," and to my mind it suggests the idea that they receive their supply of water from a channel far distant from their issue. Does not their equal temperature and regular pulsation and motion suggest strong vitality? Can we not reasonably suppose or attribute this phenomenon to the Earth's Grand Vital Force?

In this characteristic of the geysers I find unmistakable evidence of rivers of water coursing through hot rocks in proximity with fire rivers, with no connection, and yet receiving their heat

from that source, as well as receiving their supply of water from a far distant source from their issue.

Inasmuch as Mount Hecla, Skapta Jakul and their associate volcanoes, do not possess the same influence over the geysers of the island which they occupy and form a part as they make manifest in the disturbance of more distant Norway, this phenomenon points in the direction of a communication between the two countries by means of a fire river.

The volcanoes Etna and Vesuvius have been considered independent of each other, until observers noticed the fact that when one ceased eruption the other commenced. I think it was in 1869 that observers were first cognizant of this phenomenon. It was noticed that the cooling of one seemed to have been the signal for an eruption of the other. On the 26th of November in the year 1869, the last current of molten fluid descended from Vesuvius, and on the 27th (the day following) a dazzling crest appeared on the Sicilian volcano. Here, I think, is evidence of a connection of Etna and Vesuvius by means of a fire-river under the sea.

We must not lose sight of the fact that "the majority of hot springs occur either in the vicinity of volcanoes or rise from great depths in rocks of the oldest geological periods.

"With few exceptions they discharge at all times the same quantity of water, and their temperature and chemical constituents remain constant. *There is evidence to show that the temperature of some hot springs has not diminished for upwards of a thousand years."

"As you approach the lagoons," says Dr. Bowling, "the earth seems to pour out boiling water, as if from volcanoes of various sizes, in a variety of soils, but chiefly of chalk and sand. The heat in the immediate neighborhood is intolerable, and you are drenched with vapor which impregnates the atmosphere with a strong and somewhat sulphurous smell. The whole scene is one of terrible violence and confusion; the noisy outbreak of the boiling water; the rugged and blasted surface; the volumes of vapor; the impregnated atmosphere. The ground burns and shakes beneath your feet, and the whole surface is covered with beautiful crystalizations of sulphur and other minerals."

*Wells' Chemistry.

CHAPTER XVII.

SCIENTISTS GOING TO EXTINGUISH THE FIRE OF VESUVIUS.

Nearly all active volcanoes are in the vicinity of the ocean, as Vesuvius, near the Bay of Naples; Etna, on the Island of Sicily and close to the Mediterranean. "Of the two hundred and ninety active volcanoes, one hundred are situated on islands." In consequence of this feature of their position, a distinguished geologist suggests or is of the opinion that so many volcanoes being situated near the sea "suggests the method as well as the possibility of their extinction by man's agency. The sea," he thinks, "has already extinguished thousands."

We must not overlook the fact that many of the supposed extinguished volcanoes in the past have broken forth anew, destroying towns and prominent cities. We have every reason to believe that this volcanic phenomenon will many times repeat itself. Geologists assure us that "there are men in New England who would undertake to make a tunnel into the heart of Vesuvius and let in the Mediterranean and accomplish it too," and thus they hope to extinguish Vesuvius!

Ah! gentlemen, have you with all your opportunities for observation failed to discover the repairer, the plumber of the volcanoes? The Sea is the plumber into whose care the volcanoes together with their fire-tributaries were entrusted the first week of our planet's existence as a Grand Revolving Engine.

In the event of volcanic obstructions, as sometimes occur, and the crater-vents prove insufficient, either the phenomenon of earthquake is produced, or else the fire-tributary of the volcano forces a vent and makes its way into the sea. In some instances the earthquake precedes the issue of lava into the sea. When molten

matter has thus found its way into the sea, its plumber (the sea) rushes on to the hissing lava in solid phalanx with his active veterans—the battle between the two combatants or elements is fearful to behold! Phalanx after phalanx of the sea is vanquished, scalded and heated; some are retired, others are sent up in a mist to the ethereal hospital for repairs and to cool. All the while the phalanx is made good and replenished with new supplies of cool recruits. Even though the battle is fierce and long continued, the sea never tires; if the rent cannot be repaired near the issue, then in this event the repairing and soldering is commenced at a distance. The outside edges of molten matter at its most distant point out in the sea is first chilled into a crust; this accomplished the sea holds the main army of its foe a prisoner. The lava now continuing to flow is forced upwards from the wall that surrounds it, the wall all the while growing thicker and stronger, at the same time increasing its height, sometimes reaching the surface of the sea. Here the plumbing is brought to a stand, or retarded somewhat, but as the matter continues to flow it descends and increases the size of the island. When the flow ceases it often leaves not only an island, but an open crater which acts or subsides in accordance with the will of the fiery tributary that occasioned its birth.

Physicists of the present time advocate the theory that the convulsive forces of the earth are weakening and less dangerous than formerly. They predict that "Vesuvius in the far future will become extinct; luxuriant vines will ornament its sides, and people at night will no longer dread or tremble in fear of its outbreak." This is a comfortable belief if true; but if not true its belief may prove a source of danger in the far-off future to the people who erect their homes upon its flanks in the belief that it is an extinct volcano.

Pliny, the Roman naturalist, did not include Vesuvius in the list of volcanoes known to him; though Strabo recognized it as an extinct volcano; he said it was extinguished for want of fuel; yet I think we have evidence that its work was in operation all the while it was supposed to have been extinct, and at very great depth; for, in A. D. 79, when it emptied out its ash-basin, the ashes thrown out exceeded its own bulk. At this time two cities, Herculaneum and Pompeii, were buried—grand cities, occupied at the time by refined and intelligent people. "Back of these cities tow-

ered Vesuvius adorned with a belt of chestnuts and festooned with luxuriant wine-vines. About one o'clock in the afternoon from the summit of Vesuvius a dark cloud rose to which all eyes turned with appalling solicitude; ashes fell in a constant shower for days; foot by foot they rose, till houses, castles and temples were covered. We have no account of lava flowing from Vesuvius at this time. There lay the cities deep buried, and thus they slept for sixteen centuries before their day of resurrection. Other towns were built over them, the inhabitants little dreaming of the buried cities under their feet. But, in seventeen hundred and thirteen, a well being dug, the workmen came down on the theatre in Herculaneum where the statues of Hercules and Cleopatra were found.

Be it remembered that for sixteen centuries these cities lay buried in ashes—nothing but ashes—ashes that were accumulating down deep in the earth at the very time that Strabo recognized Vesuvius as an extinct volcano that had long been extinguished for want of fuel; for in the history of this wonderful eruption we have no account of lava or other material than ashes.

Pompeii was discovered forty years later. At this eruption it has been calculated that twenty-two million cubic yards of ashes were vomited out of Vesuvius.

"In 1737 there was an eruption of lava and other matter amounting to twelve million cubic yards; and in 1794 the matter ejected was estimated at twenty-two million cubic yards. In 1779 it poured forth huge masses of thick white sulphurous smoke, three miles in height, and shot therein showers of stone, scoria and ashes at least two thousand feet high. When the town of Torre del Greco was destroyed, in 1794, it was calculated that a single stream of lava contained more than forty-six million cubic feet. The same unfortunate place was ruined again in 1861."

The question has been asked from whence came this immense amount of material? "The mountain evidently did not furnish it, neither could it have come directly from beneath the mountain, or a cavity would have been formed into which the mountain would have sunk."

Gentlemen "who would undertake to make a tunnel into the heart of Vesuvius and let in the Mediterranean and accomplish it too," will necessarily take into consideration the great depth from whence Mount Vesuvius obtains its supply of material. I am of

the opinion that old Vesuvius will be able to expel, by a single sneeze, all the water that philosophers of the nineteenth century can turn on from the Mediterranean.

Cotopaxi and other volcanoes have demonstrated their ability of ejecting water when it came in their way by assuming an intrusive position on their strongholds.

"A Japanese writer relates that in 1793 a volcano of the Island of Kion-sion, one of the largest of the empire, suddenly ejected such torrents of liquid matter that more than fifty thousand of the inhabitants perished, were swept away by the waves. Similar circumstances have taken place in America; a large village near the equator was destroyed in 1797 by a river of volcanic mud."*

Some of the German journals, in the year 1868, announced seriously that a company of English capitalists made an application to the King of Naples for a concession for the extinction of Vesuvius. "The principal seat of the fire," they believe, "is situated several thousand feet below the level of the sea. By cutting a canal which would carry the water into the crater the fire would be completely extinguished, and the operation would only cost 2,000,000 f."

So powerful a force as Vesuvius maintains could scarcely be expected to receive water from the Mediterranean without offering some resistance. Philosophers could scarcely expect to accomplish more with water as their agent than to chill the surface lava into a thick crust, (especially a class of men who claim that Vesuvius connects with a central ocean of fire.) Let this be as it may, Vesuvius represents a force of fire that has maintained itself for many centuries, if not from the first moment that our planet propelled itself into space. Now in case Vesuvius remained amiable and quiet, permitting the surface lava to chill and cool—a thing that Vesuvius will quite likely never think of doing—although Vesuvius has appeared very docile in times past, so much so that Strabo thought Vesuvius was extinguished for want of fuel—all this while it was at work deep down and out of sight like a sly old puss watching for mice—remember, when Vesuvius is troubled with obstructions, it has a way of opening new craters.

In the eruption of April, 1872, an unknown correspondent

*Read Pouchet's Universe.

writes from Naples: "The view of Mount Vesuvius from this city is now the grandest that has been witnessed since the year 1631; the eruption continues with dreadful violence. Explosions of the volcano are constantly heard in Naples. A fresh crater opened to-day; flames burst from the earth under the feet of the inhabitants." * * * The day following: "Another new crater opened to-day near Tersigna, but with every fresh opening the violence of the eruption seems to abate."

If volcanoes are a part of the original plan, constituting an active, moving, propelling force, ordered to serve in the All-Wise plan of construction, is it a reasonable or sensible thing to attempt their obstruction? Is it not in open violation of natural law to construct homes on the flanks of debris where Vesuvius is compelled to empty its ash-basin?

CHAPTER XVIII.

MOUNTAIN RANGES.

Mountain ranges on both continents as well as the islands of the sea are thickly studded with active volcanoes; deep down in their recesses fiery matter throbs and pulsates. By careful observations I recognize the phenomenon delineated in a winding, irregular arrangement of mountain ranges, a form peculiar to rivers. Mountain ranges are also encountered in the ocean-bed. The phenomenon that produced mountain ranges on land occasioned the mountain ranges that encircle the Pacific ocean and wind their way down, around, and under the ocean-bed. These ranges are simply made up from molten material, ashes and debris, from beneath the refuse of fiery tributaries.

Geologists of the present time claim that volcanoes are connected with a central sea of fire. They claim that there is only a thin skin which hides the central furnace; that the skin in proportion to the bulk of fire is not equal in thickness to the shell of an egg. This is a very old doctrine, first advocated by Descartes and afterwards vindicated by Buffon, Leibnitz, Curvier, Cordier, Laplace and Fourier, and now revived by geologists of the present age. Learned men in divining the theory of the earth's formation have differed widely in their opinions. The Plutonists attribute the earth's formation exclusively to fire, and the Neptunists ascribed everything to the action of water.

In connection with mountain ranges we have abundant evidences of their fiery tributaries or origin. They are unmistakably the refuse of subterranean fire. Their zig-zag, winding, river-like forms, besides extending their lengths until they have disappeared under the ocean-bed as well as holding their own from century to century, point to a phenomenon very unlike a central sea of fire. If this doctrine has any foundation there is no reason why volcanoes

should not burst out in spots anywhere and everywhere, as they have the appearance of doing in the sea; but these manifestations of the sea are not real, as can be learned by investigating actual phenomenon. There are also mountain ranges under the sea; only the highest mountains are visible. When they rise above the surface of the sea they are recognized as islands. Many more that are not yet visible under ordinary circumstances are continually adding to their size by the refuse from their fiery tributaries, and in due time will also make their presence known and felt above the sea. Earthquakes that are felt in the vicinity of fire-rivers are probably in most cases occasioned by obstructions of the volcanic vents. The inhabitants of volcanic countries are learning to regard volcanoes when active as protectors from earthquake disturbances. We have cosmical evidence everywhere of protection. Every created animal, plant or thing has some use and work to perform in the economy of God. At the same time, there is manifest protection of all His works. We see it in the noncombustible material that is thrown to the earth's surface in volcanic regions; in proximity with volcanic material mica is found. I doubt not it is one of the earth's hidden protectors in holding in check the fire-rivers. A protective membrane, I doubt not there are many with which we are unacquainted. I am by no means insensible to the fact that physicists claim that this substance is due to pressure, but I am impressed that it is a creation, and a part of the general design that nothing is made without purpose or aim.

The earth contains much inflammable material, and I think we are protected from these forces. The earth contains a vast quantity of oil, and did in its first formation. It may be argued that oil is a product of mineral as well as of vegetable and animal matter. Be it remembered that none of these substances are capable of producing any substances, except as they draw it originally from the earth; it is simply a change, not a production. Biblical writers speak of rocks pouring out rivers of oil. It is the general opinion of geologists that oil is much more abundant as we descend deep into earth. Many assume that there are large lakes of oil at great depth. I doubt not that oil is much more abundant than is generally supposed. A large part of Canada West, Michigan, Kentucky, Kansas, Ohio and Pennsylvania are said to be underlaid

with it. "Oil-bearing rocks are thought to underlie fully one-half of the continent."*

We might dwell at great length on the oil-bearing rocks, coal mines and other inflammable material with which the earth abounds. It seems quite remarkable that learned people who are cognizant of all the facts to which I have alluded, besides many more, can believe for a moment that directly under this inflammable material there is a continual and unbroken mass of fire. Oil and coal also underlie the eastern continent, as well as much other inflammable material, and scientists ask us to believe that directly under the oil and coal is one vast sea of fire. Well, if true, they will be forced to acknowledge that it is a vast amount of material without any purpose—very unlike the economy of God so far as we are able to observe the plan of His work. He appears to subject every particle of matter to some purpose or use. I think we are warranted in judging by what we do know of Him, rather than by what we do not know. In all that we can see there is a lineal and cosmical connection, and the machinery or propelling force is at all times central.

*For interesting and detailed account of oil-bearing rock, coal and other inflammable materials read "Denton's" interesting and instructive "Geology."

CHAPTER XIX.

CAVES AND GROTTOS.

In the annual address of Chief Justice Daly, in 1875, before the "American Geographical Society," he said: "About the year 1819 Capt. J. C. Symmes, an officer of the regular army of the United States, advanced the theory, to the propagation of which he devoted the remainder of his life, that the earth was hollow and inhabited within, with an opening at the poles, which became known throughout the country as Symmes' hole.

"His son, now an old man, has revived it, and is advocating it as his father did, by delivering public lectures. The father's theory was that this hole or opening in the Arctic was about 1,900 miles in diameter and somewhat wider at the Antarctic; and now that we have reached within 500 miles of the pole, about half of the assumed diameter of the supposed hole, without any indication so far of its existence, the son believes that if Capt. Hall had got several degrees further north he would have found evidence of the truth of the theory."

Even though they should some day succeed in finding a hole or cavern, it is quite probable that they will find nothing superior if equal to caverns known to travelers in other parts of the world. Grottoes appear to run in chains, and if the interior of the earth is ever explored to any considerable extent I am of the opinion it will be by means of these chambers.

Among the numerous grottoes discovered are those of both large and small degree. "One, exceedingly beautiful, not far from Trieste, has a narrow entrance, and the descent is effected by means of rope ladders. On every side the marble forms clustered pillars, twisted into columns like trees, or handsome and numerous stalactites which awaken admiration." "It seems," said Tournefort, "as if these marble trunks vegetate;" and perceiving the altar

with its fluting of dazzling whiteness, he said, "this pyramid is perhaps the most beautiful marble plant in the world."

To what extent grottoes descend towards the earth's center remains for future investigators to establish. They do not appear to be affected with inflammable gas, as are the mines; neither is it probable that in their descent the temperature in any way corresponds or increases with that of the mines. So far as explored, the Mammoth Cave of Kentucky is the most extensive, but it is as yet imperfectly explored. "The longest chamber of the cave is estimated as nine miles from side to side. There is a deep pit known as the Maelstrom. A celebrated guide was once offered six hundred dollars if he would descend to the bottom of it, but he shrank from the peril. Finally a Tennessee professor resolved to do what no one before him had dared to do; he had himself lowered down by a strong rope a hundred feet, but at this point his courage forsook him, and he had to be drawn out. No human power could ever have induced him to repeat the appalling experiment."

A year later a more daring gentleman with a light in his hand and a rope fastened around his body took his place over the awful pit, and directed the half-dozen men who held the end of the rope to let him down into the gloom. "Thirty or forty feet from the top he saw a ledge, from which as he judged three avenues led off in different directions. About a hundred feet from the top a cataract from one side of the pit went rushing down the abyss. He was finally landed one hundred and ninety feet from the top. He found the pit in which he was landed almost perfectly circular, about eighteen feet in diameter, with a small opening at one end leading to a fine chamber. On this floor he found beautiful specimens of black silex of immense size, vastly larger than were ever discovered in any other part of the Mammoth Cave, and a multitude of exquisite formations as pure and white as snow.

"There are many abysses in the Mammoth Cave which seem bottomless. Ignited substances thrown down descend to a great depth, but become extinguished before reaching the bottom. The varied and beautiful chambers are described by travelers as surpassing in beauty and grandeur the most celebrated of king's palaces; their adornment that of 'magical splendor'—'stalactite halls decorated with pillars twisted in a thousand shapes, with fantastic statues draped in crystal mantles.' Towers, domes, temples, and

thrones formed of precious stone, dazzling in magnificence. In this grotto there are a number of chambers that have received names—such as ‘The Chamber of the Spirits;’ another, ‘The Dome of the Giant.’ The immensity of this chamber,” says D. Pouchet,* “strikes one with stupor; the cupola suspended at a height of four hundred and thirty feet overhead.” In this grotto there are rivers, cataracts, subterranean lakes, and the Dead Sea.

Every part of the earth is wonderfully constructed. A cave in the White Mountains of New Hampshire has been found of jasper, a delicate blue and ash color striped with red. It is exquisitely beautiful in coloring, the interior all of solid jasper, and has settled the long disputed question of where the Indians of New England got jasper to make their arrows.

Wyandotte Cave in Southern Indiana has been traced through its various windings for twenty-seven miles. In this cave there is a grand hall said to be two acres in extent, with a grand central column formed of stalagmite. On its summit is a fantastic pillar of the same material. In this and other chambers stalactites, pendants and jewels adorn amphi theatres and towers; alabaster pillars and columns on magnificent pedestals, festooned with vines of jewels of artistic and varied design; chandeliers of radiant splendor draped and festooned in crystal beauty.

There can be no reasonable doubt that, if the earth’s interior is ever explored to any considerable extent, investigation will necessarily be traced or carried out by means of grottoes; they probably extend through various parts of the earth. Rivers that wind their way alongside and through grottoes could in many instances be made available or useful as guides in directing and pointing out the course of a chain of grottoes.

If investigation is ever carried earnestly to any considerable extent, it will dispel the erroneous view or belief in either an undue increase of pressure or heat as we descend towards the earth’s center. One part helps to sustain every other part as is evinced in the formation of grottoes. Their lofty ceilings, from which are suspended in mid-air fantastic pendants on a grand scale, all sustained and supported with massive columns and grand pedestals,

*Read his Universe.

as well as with partition walls and substantial floors—one whole—each part serving to sustain every other part.

In tunneling into the earth workmen encounter heat, and so they do arteries of water the same, and turn back; hence the supposition that heat increases equally and correspondingly with each descent into the earth's interior. But this supposition is not sustained by facts, for sometimes heat is encountered quite near the surface.

At Idaho, ten miles from Central City, in Colorado, the ground is so hot that miners washing for gold are compelled in consequence of the heat to stop digging at a depth of twenty feet. This phenomenon is in the vicinity of hot springs. Digging and mining is usually conducted in the vicinity of fire-rivers, and in digging perpendicularly at any great depth they are likely to be encountered anywhere, the same as arteries of water.

Grottoes appear to be supplied with abundant and good air and running water. This feature suggests the idea that they run in chains, in a series of links of vast extent. Air circulates over the running water and is supplied from another source besides the traveler's entrance.

We have no reason to doubt that chambers and halls, in series of chains, lead into deep recesses of the earth, and that grottoes increase in beauty and magnificence with their descent. We know that the valuable and heavy metals, as well as precious stones, are brought to the surface from great depths. It is not improbable that in those regions of precious metal grottoes of gold are waiting for the admiring eye of human intelligence to behold their splendor.

Magnificent grottoes are found in different parts of the world—in Europe and Asia as well as in the Western Continent. It is by no means impossible or even improbable that some of the chains extend from continent to continent deep down under the sea.

“The temperature of caverns, when the roofs are massive and the openings narrow, show little diversity, being below that of the mean of the surrounding atmosphere; but there are some which exhibit the apparent anomaly of being coated with ice in summer which melts in winter. It appears that only such caverns as are situated in volcanic regions exhibit hot and sulphurous vapors or irrespirable gas. Wind caverns are exceedingly interesting, inasmuch as their phenomenon has an important bearing in illustrating

the Earth's Grand Vital Force—the alternate drawing in and blowing out with the regularity of the ocean tides, if not corresponding with the time. Here is a force that cannot be attributed to either the Sun's or the Moon's attraction.

How remarkable that any person or set of people can believe for a moment that the Creator of the Universe, who has displayed such boundless wisdom in giving locomotion to minute creatures, such as live in the blood of animals, left the planets so unfinished as to perform their revolutions by the simple means of attraction. There is no scientific reason why an attraction sufficient to cause the tides should not also be sufficient to bring the planets into collision with each other.

Blow-caverns are quite common in all countries; they are of both great and small degree. **"A few years ago a man in digging a well in Portland, Oregon, suddenly struck his spade in at one side of the well making a small hole, and forthwith there rushed out a volume of air which came with such force that he was considerably frightened, making his way to the surface ground with all possible speed, and has not been down since. On arriving at the top he found that there was a strong current of air coming up out of the well. It was pure air and no sign of gas. He proceeded to cover the well-hole over with boards for safety, and in one of the boards there was an auger-hole through which the air came with such force that objects placed over the hole would shoot up like a balloon. After blowing out for four days the well took an opposite freak and began sucking in air with the same force. There are no sink-holes near, and no hills or valleys. The inquiry is made, where did the air come from, and what power or effect draws the air in? The noise coming in or going out is heard a long distance away."*

† *"Blowing Cave of Georgia, first discovered in 1836, situated in Decatur county, is at the bottom of a small basin, (whose diameter will not at any point exceed eighty feet,) in a perfectly smooth plain, and surrounded with a dense copse of wood. There are no indications to lead to the supposition that it was occasioned by any eruption, or of a volcanic or convulsive nature, as the face of the*

*From *Portland Oregonian*.

†Correspondence of the *Mobile Times*.

surrounding country as well as the immediate neighborhood of the cave itself is wholly free from stones, ruggedness and other marks of convulsive action. When first discovered and brought into notice by Colonels Barlow and McKinsley, in the years 1836 and 1837, the orifice of the cave was three or four feet to the left of the present one and much larger. Col. McKinsley proposed exploring it, but in attempting to sound it with lead and line, and failing to touch bottom, gave up the undertaking as too hazardous for further venture. The present mouth of the cave is about one and-a-half feet in diameter, through which at one period of the day there issues a strong current of air, not in puffs, but a continuous stream with a roar that is heard at a distance of sixty or seventy yards; at another period of the day the suction is relatively as great. Leading from all points into the basin are Indian trails, deep worn, indicating much visiting to the cave by the red man ere the axe of the white man woke up the echoes of the forest, and it was probably regarded by them as a place of sanctity where they held communion with the spirits in the great hunting grounds."

"From a blowing cave in the Alleghany Mountains a hundred feet in diameter the current of air is so strong as to keep the weeds prostrate to the distance of sixty feet from its mouth."

* "But the most extraordinary example is the great cavern of Ouybe, of Asia. The tempests that rush from it are sometimes so violent as to carry off everything on the road, and throw them into an adjoining lake. The wind coming from the interior of the earth is said to be warm in winter, and so dangerous that caravans often stop for a whole week till the tempests have subsided."

By conceding the earth a Grand Vital Force, this phenomenon is reasonably explained, otherwise it is inexplicable.

*Johnson.

CHAPTER XX.

GRAVITATION.

At the age of thirteen the doctrine of gravitation was brought before my notice. In the school-room an open book lay on a desk to my right, (owned by another pupil;) my eyes accidentally caught a glimpse of what seemed to me a very remarkable sentence: "A ball falling to the earth attracted and actually moved the earth." The owner of the book, noticing my restlessness and effort in the endeavor to read it at a distance, very kindly permitted me to take the book to my own desk, where I could peruse it at my pleasure.

The doctrine of large bodies attracting small bodies was elaborately explained—the Sun's influence upon the Earth, as well as the Earth and Moon's power over each other by means of attraction. "A ball falling to the earth was moved by the earth's attraction; and the ball in proportion to its own weight in turn attracted and actually moved the earth."

For the time being my whole soul was engrossed in the subject of gravitation, although I regarded it as the most unreasonable thing I had ever heard. I was so much shocked at the absurdity that I could think of nothing else—did not think of or look at my lessons. When the spelling class was called I took my place in the middle, but missed every word and soon descended to the foot, but was in nowise discomfited, for my whole mind was absorbed in the doctrine of gravitation.

At the close of school I hastened home and rushed into the presence of my father; at once I sat about disclosing to him the unreasonable doctrine that was taught in our school. He listened thoughtfully to my impulsive speech, and very calmly and deliberately enquired my reason for disbelieving that a ball falling to the earth did not really attract and move the earth in proportion to its own weight?

Finding myself somewhat deficient in language and unable to explain precisely my thoughts on the subject, (that it took a certain amount of united force to produce the first action,) or that there must be an amount of force a little more than equal to the resistance to produce any action whatever—I sought to explain my position by way of comparison. You remember (I said) that load of stone in front of our home yesterday, that a span of large horses drew with such difficulty. You remember that it took the force of both horses together to draw the stone, and when they stopped to rest one horse could not start the load a single inch until the driver whipped up the lazy horse and made him help. If the doctrine of gravitation is true (said I) you could hitch up a flea before the load of stone and his force would actually move the load a little way; whereas we could see that one horse alone was unable to move the load the least distance.

A deep smile of approbation spread over the countenance of my father, and he assured me that my reasoning was correct, and that I need never believe any unreasonable thing even though it was printed in my books.

Many years have rolled over my head since that event, but I have never changed my opinion in regard to the doctrine of gravitation. I am of the opinion that common sense is as important in philosophy as in any other thing. Much of the philosophy of our time is so very superior and lofty as to be utterly invisible to the common sense mind; such reasoning can never be condensed into solidity.

The Earth's Grand Vital Force (gravitation) has a claim on every creature, tree or plant within its domain. It is always unyielding—never under any circumstances relinquishing the claim upon animal or vegetable substance that has been derived from its own matter. There is not a creature that walks upon ~~the~~ ^{earth's} face who is not continually reminded of the claim and rendered weary by a constant drawing to which it is subjected and held by the Earth's Grand Vital Force (called gravitation.) When the creature's independent vital spark (God-given thought or soul) wearies of the earthly mortgage it rises aloft, leaving the clay, the "dust to dust" and to earth, its original owner; it is thus transformed into new relations with other life.

This vital force (gravitation) does not at all times as is gener-

ally supposed draw toward the center—the same force under an opposite impulse—as from the impulse of resentment the same force is reversed and sent in a direction opposite from the center. Undue crowding or a surplus of force excites the impulse of resentment, the force moves in an opposite direction, from towards the center. By this impulse, the force of resentment, all surplus matter as well as surplus of force is thrown to the surface to be worked over and reconstructed.

We have a striking illustration of this impulse in the cyclone, which appears as though a surplus of force were thrown to the surface for reconstruction. A cyclone in Macoupin county, Illinois, is described by engineer Cutter of the Chicago and Alton express train, which was running at full speed, and met the tempest at Carlinville. Mr. Cutter saw out on the prairie what he supposed to be a straw or haystack on fire. As he approached it he saw that it moved rapidly towards the track and then realized that it was a cyclone of the most appalling character. It was a dark funnel-shaped cloud reaching from the ground high in the air, where it disappeared into the clouds. It was black and dangerous looking, and whirled with terrible velocity. Its voice, heard even in the distance above the rumble and roar of the train, was frightful in the extreme. The cyclone seemed to travel at the rate of twenty miles an hour, and was so fast approaching that the moving train must in a moment of time inevitably strike it. Mr. Cutter shut off his engine and applied his air-brakes just in time, for despite the precaution the train touched the cyclone's outer edge. Mr. Cutter describes the sight as the most horrible he ever saw. The air was lurid and dark, and hot as if from an oven. Everything in the pathway of the storm was demolished and crushed, annihilated. Barns, fences, sheds, telegraph poles, and everything was swept up. Mr. Cutter and his fireman crouched down in the tender, and for a moment feared that the whole train would be overturned. The cars were only held on the track by their safety chains. The passengers, who at first wondered at the stop, with blanched cheeks and terrified countenances viewed the terrible monster of the air in its work.

This cyclone seems more remarkable for what it neglected to do than for what it accomplished. Its phenomenon in no way establishes the view advanced by prominent physicists—(that of iron

railway attracting the cyclone.) In this instance, although it advanced to and crossed the railroad track, the occurrence appears to have happened. In place of the iron fixtures of the track or the train being the means of attracting, they seemed to have merely happened in the cyclone's path. Although the train touched the cyclone's outer edge neither the engine or its iron machinery appears to have attracted the cyclone the least particle from its original course, otherwise the train would have been annihilated. The hot air suggests electrical excitement, and the train is represented as only being held on the track by the safety chains. Had the cyclone passed directly in the path of the train, the iron machinery as well as the safety chains would without doubt have melted and expanded into vapor.

We have in this instance an illustration not only of power, but of remarkable independence, as the cyclone pursues its course regardless of every substance or object just out of its determined course.

A tornado that visited Quincy and Degraff in Logan county, Illinois, is a remarkable instance of the grand force reversing its force, (gravitation,) throwing its surplus of force to the surface for reconstruction.

"In Quincy, sixty dwellings and stores and two churches, shops, stables and outbuildings were unroofed, rocked upon their foundations or demolished. The air was literally filled with flying boards, furniture, lath and plaster. A parlor stove was caught up by the wind and hurled through the air, and falling upon a woman crushed her so that she died. The tornado on its way to Degraff struck a flouring mill five stories high, containing 3,000 bushels of grain, moving the building nine inches upon its foundation, and carrying away the roof and a portion of the fifth story. After leaving Degraff it passed several settlements, and finally rose from the earth and was seen for miles carrying in its funnel-shaped form timber, rails and debris which it had gathered in its destructive march.

The St. Louis *Globe* reports Lieut. Finlay of the Signal Service as saying that "it is a great mistake (the theory) that cities are in comparatively less danger from tornadoes because the heavier and more durable structures may be expected to break up the cloud vortex and thwart its fury. Recall," he says, "the visitation

at Philadelphia only last August. The tornado which swept through Marshfield, Mo., with such awful consequences, would have plowed a furrow through St. Louis had it struck the city instead of the town. The greatest structures of stone and iron will, in my opinion, melt like wax in fire when the vortex reaches them. New York, with its great environments and its millions of people, may suffer when it least expects. I never see the Brooklyn bridge that I don't think what a splendid target it would make for a tornado. The vast framework of steel and iron will be torn from its piers and buried in the East River if the vortex ever strikes it.

"Tornadoes are neither increasing or decreasing. There is no change, no prospect of a change, that we can see in the frequency of them or in their violence. As the country becomes thickly settled the losses are greater, because there is more to destroy in the path. Where a few years ago the tornado-cloud spent its fury on unoccupied prairies or in forests, now it sweeps over cities, valleys and farms. The average number of tornadoes are maintained.

"From the data we have we confidently look for about 160 of these visitations each year. There are theories held that as the western country undergoes transformation through settlement the atmospheric conditions are changing so as to affect the number and force of these whirling clouds. Our records and observations do not show such results. We remember what took place at Grinnell, that beautiful Iowa town, in 1872. The cloud encountered in succession three great stone and brick structures of the college and levelled them with the ground; that did not break up the vortex. The cloud swept on with strength enough after that mighty wrestling match to lift up a sixty-ton engine and train of freight cars, scattering them out upon the prairie. It continued its course for miles before it gave evidence of lessening fury.

"We can't build big enough or strong enough above ground to defy the tornado. We have material evidence, and we have material deduction to demonstrate this. We can figure out a whirling velocity of 2,000 miles an hour for the moment about the vortex. Conceive that if you can. It means a force equivalent to our atmospheric pressure of fifteen pounds to the square inch. Let me apply an air pump to the capitol there and remove this natural pressure of atmosphere, and how long before the massive pile would tumble into a heap? And yet here is an equivalent force

turned loose to execute its freaks. Experiments suggest relief, not remedy exactly, but a plan to warn people when and where tornadoes may be expected.

"We cannot prevent the destruction of property, but we can give warning, so that the loss of life and injury to body may be averted. We have tested the matter and satisfied ourselves that we can. For two seasons we have been experimenting. Our work began in March 1884, and was continued through two tornado seasons, ending last month. The country especially subject to tornado formations was divided into eighteen tornado districts, averaging about one hundred miles square, and each of the districts was cut into four parts. Predictions based upon our knowledge of the prevailing conditions were made for each of these subdivisions. At first we attempted predictions eight hours in advance, and afterward sixteen hours. The percentage of verifications were fifty-five. We sent out no warnings because this was experimental work, but we are entirely satisfied that we can predict and locate tornadoes with considerable accuracy. We propose to give cautionary signals of tornadoes to the interior sections, as we do of storms to mariners."

Lieut. Finlay takes a matter-of-fact view of the cyclone problem. He does not entertain the hope that man's agency will be sufficient to resist or overcome these powerful forces of nature. He suggests the very practicable and feasible idea of using precaution and adaptation to these natural forces by retirement from their august presence, in place of attempting some futile effort to overcome the vortex.

Western journals furnish interesting details of the terrible calamity that befel Hazel Green, a town in Wisconsin. "The first premonition received by the citizens of the approach of the cyclone was the appearance of two dark clouds on the horizon, one to the south and the other at right angles, and probably at about two hundred feet from the surface of the earth. When about a quarter of a mile to the southeast of the town they seemed to come together, or to telescope each other, and then with a terrible reverberation, as of the discharge of a thousand cannon, sunk to the earth. It struck the ground a mile southwest of Hazel Green, and ploughing a furrow 600 feet long, four feet wide and several feet deep, it seemed to absorb the earth and rocks. As it moved along

in a south-westerly direction, it looked like a clay column whirling with incredible speed around a central vacuum.

"As the cylinder came up the slope the rush and yell and whirl of the column sounded like the rush and shrieks of the wind on the sea and like the thunder of guns, attracted the attention of the people of Hazel Green and they flocked to their doors and windows. Steadily it came on, sometimes bounding fifty feet into the air, then rushing down again. In two minutes it descended on the little hazel grove just southwest of the town. The trees were snatched up by the roots and whirled ninety feet into the air and supported there. The cap of the column* was a stone eight feet long, three feet wide, and three feet thick. This stone was held in its position while the column covered a space of three-quarters of a mile.

"Just between the grove and the town, 250 feet from either, the column halted and spun around over a small space, and then recommenced its march. Twenty-six houses were carried beyond the ken of mortals—where they went no one can tell. The track of the column is filled with saw-dust and bits of wood, as though a sawmill had belched out a half finished lumber yard. A woman was sitting in her kitchen; the house disappeared as if touched by a magician's wand, and the woman was found 400 feet off. Of the rest of those killed nothing can be said, beyond the fact that their bodies were found not less than two hundred feet from where they started.

"Probably the most remarkable spectacle was that of Dr. Kitoe's horses; the barn, buggy and horses were lifted sixty feet into the air, and the horses dropped at least one hundred rods from the former site of the barn. The column then was a huge mass of debris, and a spectator says the horses went up through the center of the column, whirling around so swiftly that they looked as if torn to pieces; but they were found utterly unbruised and stone dead, not more than ten or twenty feet apart. The incidents of those two minutes (for the whole affair did not last longer) would fill a volume!"

Cyclones evince in their phenomenon that matter does not at

*Here we have an illustration of the same force that is supposed to draw towards the earth's center—acting from an opposite impulse—suspending a huge stone in the air.

all times gravitate towards the earth's center. I am impressed that the earth's force, (vital) according to the capacity of its strength, draws everything to its own place. In case of obstruction surplus matter is (as is the surplus force) suddenly hurled from its intrusive position to the surface for reconstruction.

The reconstruction of matter, or force, cannot take place until the exhalation or momentum by which it was thrown off has spent its own force. By careful delineation of nature in its various manifestations of force we observe that the propelling force of each living, moving body, whether great or small, is at all times located within the body. Each living, acting body possesses locomotion peculiar to itself. Each body lives within another body, and is also governed by the larger body, and held in subjection to prescribed limits within the superior body. Creatures who live in the blood of animals have their own independent vital force and power of locomotion, but at the same time are subjected to the larger body's force, and are continually drawn and swept by its influence, as the blood performs its revolutions to and from the heart. These larger bodies live within a larger body (the Earth) and in turn they are drawn and swept by its influence; they are at all times held in prescribed limits by the Earth's Grand Vital Force. If they ascend to the top of lofty mountains blood starts from their pores; and if the mind and will persist in opposition to the earth's claim, a dissolution between the soul and body (the earth's substance) is the result.

In connection with this subject I have already pointed out reasons for believing that the earth's propelling force is central. We have evidence not only of the Earth's Grand Vital Force, but also evidence that the Earth's Grand Vital Force is held in subjection to a superior force, (the Great Grand Force.) With the earth's independent power of motion it is not free to move anywhere and everywhere, but it is at all times held in subjection to the Great Grand Force. As it propels its way through immensity of space it is forever doomed to pursue in its course a certain path within the domain of the Great Grand Force.

CHAPTER XXI.

"FOSSILS THE LETTERS" OR FOUNDATION OF PRESUMED HISTORY OF THE WORLD.

Is it enough that the masses of mankind are endowed with reason if they leave a few individuals to do their thinking, without submitting the opinions of the few to a test with their own common sense? Is it remarkable that they have, from time to time, been deceived by those whom they were accustomed to regard as learned? * "At present," says D. Pouchet, "the Bible order seems replaced by quite an opposite tendency of argument. Scientific facts, the value of which cannot be contested, clearly establish the antiquity of the human race, notwithstanding which for some inexplicable reason certain geologists make every effort to nullify this great discovery."

On a western bound train of the Buffalo and Hudson River Railroad, two gentlemen discussed the subject of evolution and modern geology in connection with the Bible. "You see," said the first, "either the Bible or else modern geology has got to go under. I think it is a fixed fact the Bible is played out." "It looks that way," said the second; "both can't be true, and I believe truth will stand; but early education as in my case makes it a little difficult for me to give up the Bible. You see, with me it is a kind of superstition handed down by my mother, (with the mother's milk as it were.) She was a sincere believer in the Bible." "You have struck the key note! It is the women, and they are about all there is left of the Christian world. Go into any of the churches and see the large percentage of women. Women don't understand deep subjects like geology; and a woman is never inclined to accept anything wherein she can't understand all the points.

*Read D. Pouchet's Universe (a most excellent work.)

I don't understand on what ground geologists found their belief, but it is enough for me to know that geology is represented by such men as Professor Huxley of England, and all the learned men of any account in our own country."

This man represents a large class of men who discard the Bible on scientific principles (as they suppose.) They do not find time nor think it practicable to investigate for themselves, but are decided in their opinions all the same.

Now let us descend to solid facts and examine this popular system of geology. "Fossils are the letters," say geologists, "in which the history of the world is written, and without them we should not have known the past history of our planet."

"In some of the sandstones," say geologists, "are formed impressions of what we regard as the feet of birds and reptiles, and others that unite the character of both, differing from all existing animals."

By these tracks they compute the age of rocks. They claim that certain forms of life lived at certain distinct periods separate one from the other. While dealing with fantastic rock impressions, is not fancy in danger of running away with reason and substituting imagination for sound judgment?

I was strongly impressed with the opportunities nature affords for imagination to run wild with speculation in regard to imaginary monsters of the long ago, while reading a pen-picture from Bayard Taylor,* wherein he describes interesting phenomenon. "Mounting between gardens of orange and lemon trees," he says, "clumps of cactus, glossy crab-trees and vineyards of *Lacryma Christi*-vines, we reached the limit of the cultivated fields in three-quarters of an hour. The entire Bay of Naples, from the Cape of Minerva to Ichia, was constantly in sight below us. The ragged black crests of the lava fields of 1858, which had been in sight since leaving the suburbs of Resina, now gloomed close at hand, and the path, winding around a spur of the mountain, struck at last across the surface. I had seen streams of cold lava before, in Sicily, Mexico, and other parts of the world. I have gone over the track of eruption, ancient or recent; but I never beheld such a chaos of hideously,

*From Naples, January 7th, 1868; his observations of Vesuvius' great eruption, as reported to the *New York Tribune*.

horribly distorted forms. Torn and twisted in every direction, rising into peaks or ridges, split in clefts or sinking into ravines, the lava of a dismal dead-black hue suggests a world of monstrous, abortive shapes; which have first putrified and then petrified. Hides of rhinoceros, strange crushed beasts and saurians with the entrails protruding; backs, legs and bellies of lumpish half-human beings; huge scalps and rolls of sodden hair, and shapes which represent you know not what, only you know that it is something disgusting, are here tossed together. Everything is solid, yet it seems falling to pieces from corruption. Nature must have been momentarily insane when she did such a thing as this.

"Ugh! It was frightful. The path was built with great labor through the heart of the lava-fields, the ridges of which shut out almost everything else from view. When we caught a glimpse of Naples, down one of the clefts, it was like looking upon Paradise from some deserted corner of Hell."

Geologists of our own time are not quite satisfied with what they designate as tracks in the rocks, and so with large guesses and splendid fancy "they have represented large and fantastic creatures as if they had been drawn from nature."

The head of an animal was found in the River Neuse, in Holland, which puzzled naturalists. Some thought it a whale, and others a crocodile, others a lizard. I have read a recent geological work in which the author declares emphatically "it's a lizard!" While there is any disagreement in regard to its identity, common sense people will suspect it is either a crocodile or whale.

The exclusive right of the delineation of nature does not belong to any particular or specified set of individuals. The book of nature is open to all and deserves a share of attention from each and every member of the human family who is possessed with the average amount of reason. The human family are more equally endowed with reason than many are inclined to believe. One class overestimate their acquirements and learning, and underestimate the natural ability of others. There is more than one kind of education. Some men seem to have received learning from a higher source than the schools. The same Instructor that teaches the little birds to build their nests seems to have instructed such men as *Æsop*, who was born a slave and a poor little hunchback;

but, for all that, by means of his reason, he was the superior of potentate and kings.

Every epoch has illustrated the fact that all knowledge does not belong to a single class of individuals, even though they are known as learned. Great knowledge is more likely to be an inheritance than an acquisition.

"In the Middle Ages," says Pouchet, "fools gave themselves up to punishment and death. This state of society we must admit with sorrow was in great part the work of learned men of those times. The most eminent men of the Middle Ages, who could discuss all branches of human knowledge with perfect clearness, seemed struck with blindness so soon as the question turned upon monsters."

Instead of disputing error they lent the weight of their authority to sanction it; they originated imaginary monsters to alarm the masses and in this way engendered a sickly and depraved imagination among the people. Would it not be quite as well for science and its moral bearing upon society if physicists of the present age were at all times satisfied with what they have evidence of, rather than an inclination to build and tower up to great heights of fancy imaginary monsters for ages long past?

Wherein so much truth and fiction is mixed together in a conglomerate mass, its deleterious effect is now more especially felt by reason of this busy and industrious epoch. The majority have but little time to unravel and separate the actual from the unreal.

The age of our planet must always be defined by a large part guesswork. Can we be quite sure that the age of our planet is more accurately defined than that of the Cardiff Giant—the great American humbug of 1869; although a humbug it was not without its purpose and use, for it subjected geological wisdom of the age to a grand and wonderful test. A correspondent of the *Chicago Tribune*, in 1869, disclosed the fact that he was one of the sculptors of the beast, the stone for which was actually got at Fort Dodge, Iowa. This man who signs himself "F. Morhman," was "to have one hundred and forty dollars for his share of the work, but never received a cent." His fellow sculptor, Henry Salle, got forty in cash. George Hull, a former owner, was the man who hired them. They had a model but three feet long to work from and beer was supplied. Morhman says the figure was proportioned

except in the back, where a layer of stone peeled off and left the body some inches thinner than it should be. The figure was pronounced complete in the latter part of October. Hull came occasionally to see how the work progressed. Hair had been carved on the head and a beard on the chin. Hull did not like this when he saw it and said he would see about it. When he came the next time he told us that he had consulted with a geologist and was informed that hair would not petrify, so he ordered it to be clipped off and we shaved the giant. Several ways were tried to make the figure look old, and at last one was invented. Quite a number of needles were placed in lead with their points protruding and the figure was pricked over with this. Two days were occupied in this work, as the chisels left marks on the stone which had to be effaced by the slow process of pricking. Some vitriol, sulphuric acid and English ink were next procured and rubbed on, which gave the antiquated look required. Hull thought at first it would be best to put on a clay covering, but concluded it had better not be done, as the clay where the statue was to be buried might be different. He was undecided where to bury him at first, and suggested Mexico. I told him I thought that would be a good place, but he finally concluded not to take it there as the distance was so great. Hull at one time proposed that we should insert in the figure here and there petrified pieces of wood or stone, so that when geologists called to see it he could clip off a small piece and give it to them to examine; this however was not done, as he could not find the pieces."

Morhman gave full particulars, dates and places, which would soon have exposed his story if it had been untrue; it was evidently authentic in every particular. A brilliant constellation of scientists paid reverential honors to this colossal form of the "great unknown" something, whether it was the work of God or art they could not say. Whether it was born into the world and had once received the kind care and fond caresses of a loving mother, or whether like "Topsy" it grew "without being born," science was at a loss to know. But the most who honor the learned profession were quite sure "Mr. Cardiff lived so far back in the past that he might have been drowned in Noah's freshet." But then the honey-combing of one of his legs indicated that he "might have come to his death from the effect of a fever-sore."

Surely it was a big fuss for the learned world to make over a thing whose burial and resurrection took place within twelve months of each other. In this case physicists figured a yearling to be anywhere from one to five thousand years old. They were unable to distinguish between a block of gypsum and a petrification. The people of Syracuse were out to the amount of eighteen thousand dollars, and the gentlemen who bought the Giant on the representation of scientists thought they were greatly imposed upon. The thing was finally exploded, not however by the interference of science, but because practical workers traced the gypsum mystery from the quarry from which it came, an unshapen block, through all its travels to the spot from which it was resurrected near Syracuse.

CHAPTER XXII.

WORK OF EVERY AGE.

"When the age of shells was," say geologists, "shells were so numerous that their accumulative remains made beds thousands of feet thick."

"When the age of fire was," they say, "the globe existed in a state of universal fusion."

"When the age of plants was, so numerous were they that the world's fuel for centuries to come is the excess of that vegetation buried."

Are these indications that fire, water, plants or shells, each worked out its own age separately? Are the accumulative remains of shells that now lie buried in different parts of the earth the work of a single age, or are they the accumulation of each and every age? Have they not gone hand in hand with the plant age, the volcanic age, the fire age, the glacier age, the water age? Are they not as busy now as at any other period in burying their dead and bringing forth progeny?

In volcanic lava, cinders and ashes, do we see the work of a single age, or do we see the work of each and every age from the primeval morning to the present time? Is not this age in which we live a shell age, a plant age, a volcanic age, a water age, a glacier age, a fire age?

A distinguished author thinks "five minutes' examination of a fossil ichthyosaurus should be sufficient to show the obscurity of" (the following passage):

"All things were made by the Omnipotent, when out of chaos the creative fiat brought a perfected world."

I have examined the drawing of the wonderful fossil which should convince by a "five minutes' examination." It represents the head of either a lizard, crocodile or whale. Scientists have

disagreed in regard to what it is; but notwithstanding this disagreement, the author thinks that a man who is thereby not convinced or can believe this world was brought out of chaos by the Omnipotent, and created a perfected world, "must have a larger swallow than the creature" (he illustrates with a drawing,) "and should be labeled and laid away on a shelf as a fossil curiosity for the consideration of future generations in the year 2,000, when the existence of such creatures may be denied."

CHAPTER XXIII.

THE GRAND FORCE THAT OCCASIONS OCEAN TIDES AND CURRENTS.

The oceans, which cover nearly three-quarters of the globe, are in continual motion; they ebb and flow perpetually; they have alternate elevations and depressions called tides, the flux and reflux of the sea, as well as ocean currents permanently flowing like great rivers in the sea. The tides and ocean currents are evidently dependent upon the same fixed and determinate laws in obedience to which the planets perform their revolutions.

The ancients considered the ebbing and flowing of the tides as one of the greatest mysteries in nature, which they were utterly at loss to account for. It is now supposed that the sun and moon are the agents in producing these motions. There is not a particle of evidence that either the sun or moon possesses power of attraction sufficient to attract so much as a drop of water one inch from the earth, except by the law of heat which causes water to become warm and expand; thereby it is rendered lighter than the atmosphere that surrounds it, and it rises in the form of vapor in conformity to the *great general law* that causes all bodies to expand by heat and contract by cold. When chilled it descends in accordance with the same general law. If the vapor had been raised through the influence of attraction, it would never stop until it reached the sun.

An attraction with sufficient power to raise the vast ocean from its bed would also be sufficient to attract the atmosphere and vapor clouds from the earth. The moon is credited with being the principal agent in producing the tides. Can this be possible and we remain insensible to its attraction? Why are not the tides highest when the moon is on the meridian, or due north and south? In the open sea, where the water flows freely, the moon has gener-

ally passed the north or south meridian about three hours when it is high water. Is it a reasonable supposition that the sea's elevation is from the moon's influence after the moon has passed the meridian?

We are told that the highest tides are produced by the conjunction and opposition of the sun and moon. But the highest tides happen not on the days of the full and change, neither do the lowest tides happen on the days of their quadrature. The greatest spring tides commonly happen two days after the new and full moon; and the least neap tides two days after the first and third quarters.

We have evidence of a submarine force capable of lifting the vast sea. Earthquakes are preceded by a general stillness in the air; the sea swells and roars, without wind, sometimes rising to a great height and overflowing the land, and then sinks back as suddenly to its level. This submarine force no one will assume for a moment is dependent upon either the sun's or moon's influence. I think we have evidence that this rising and receding, this throbbing and pulsating of the tides, is due to the Earth's Grand Vital Force.

When we consider the wonderful and complicated mechanism and power of locomotion that God in His wisdom has bestowed upon creatures from the minutest molecular through all the ascending grades up to man, is it not quite remarkable that any person possessed with reason could suppose for a moment that the Great Architect who has lavished such complicated propelling force upon inferior creatures could leave the planets so unfinished as to perform their revolutions by the simple means of attracting and being attracted, aided by a centrifugal force, (cause unknown)?

"The bed of oceanic waters," says Johnson, "exhibits similar irregularities to those which mark the surface of the dry land—abrupt eminences, gentle slopes, and deep depressions—and hence the various depths of water now beyond the reach of the sounding line, or a thin stratum scarcely concealing the sandbank from the eye of the navigator. Off a low, level and sandy shore the sea is in general shallow for a considerable distance, and very deep close to a bold and towering coast. Near to islands of a coral formation, which are so little elevated as not to be visible at any great distance, the Pacific Ocean frequently shows profound depths.

Within a mile and-a-half of Keeling Island no bottom was found with a line of 7,200 feet—plainly proving it to be the crest of a lofty submarine mountain with sides steeper than those of the most abrupt volcanic cone.”

The phenomenon of elevations and depressions, hills, valleys, and lofty mountain-chains, the same as we observe on the continents, are observed in the form of the ocean-bed.

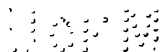
Some physicists aver that the ocean-bed has once been dry land, and the land that is now dry was once under the sea. This theory is probably true; we have evidence of it in certain regions of the globe. These changes were not due to convulsions, but were probably the work of a slow process of change.

Many people are inclined to see manifest in the earth's greatest strength the earthquake or cyclone, whereas they are generally the manifestations of disorder, the weaker forces of nature. Grand and august strength is delineated in silence and power by means of regular motion in the majestic revolution of the planets, in the flux and reflux of the sea, in the grand and progressive lifting up of the ocean-bed above the sea and transforming it into continent and dry land; in the same gradual way renovating and renewing worn-out land by depressing and submerging the same under the sea. By means of the earth's vitality it is subject to continual change and repair.

“In 800 years,” says Humboldt, “the eastern shore of the Scandinavian peninsula has risen perhaps more than three hundred and thirty feet; and if this movement continues at a uniform rate, in twelve hundred years parts of the bottom of the sea, now covered with fifty fathoms of water, will begin to emerge and become dry land,”

“Darwin and others have affirmed that very extensive regions of South America were formerly the theatre of slow and progressive upheavals which gave birth to the plains of Patagonia, all over which are scattered recent marine shells.”

In these slow depressions a continent submerged under the sea would evidently retain nearly its former shape, its valleys, hills and mountain-chains; even the fire-rivers that are the parent or cause of mountain-chains would preserve their vitality and force; for when the volcanic vents were submerged they would resist and raise their ramparts above the level of the sea, bringing into requi-



sition the same forces and manifestations that we observe in volcanic islands of the sea at the present time.

"Nothing perishes in this world," says Pythagoras, "but things merely vary and change their form. Solid has been converted into sea. Sea has been changed into land. Marine shells lie far distant from the deep, and the anchor has been found on the summit of hills. Valleys have been excavated by running water, and floods have washed down hills into the sea. Marshes have become dry ground. Dry lands have been changed into stagnant pools. Volcanic vents shift their position. There was a time when Etna was not a burning mountain, and the time will come when it will cease to burn."

Pythagoras lived before the time of Homer, but his prediction in regard to Etna is not yet come to pass, for at this time in the month, May 25th, 1886, news reaches us "that Mount Etna is in a state of violent eruption. A heavy torrent of lava is streaming down its sides and advancing toward and threatening to engulf the town of Nicolosi and the adjacent country, whose inhabitants are flying from their homes."

Although Strabo supposed Vesuvius had gone out for want of fuel it is yet in a strong and healthy condition.

"Stromboli is always throwing out flames; since the days of Homer it has served as a beacon to navigators approaching the Eolian Islands."

People have persisted in building their homes upon the flanks of what they supposed were extinct volcanoes; and history has repeated itself many times with fire and smoke. Molten lava has issued from furnaces and cast its waves over their homes. In the midst of this terrible gloom the occupants, not recognizing their own responsibility in defying natural elements, have become crazed with excitement and lost confidence in God. In place of being instructed or profited by sad experience, they have sought to instruct God; rather than yield, for this object, they have obstinately forced their way to the mouth of burning craters with supplications and prayer that these natural forces be blotted out for their convenience. If these unfortunate people had recognized the fact that it was their place to receive instruction from the Omnipotent rather than offer instruction to the All-Wise in regard to duty, they would have recognized the supreme right of these

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forces and given them a wide berth. Had they used the natural sense that is given to the average of mortals, and associated it with prayer for wisdom, all the wisdom they needed would have come to them. Are we not commanded to pray for wisdom? People who sincerely offer supplication for wisdom do not by prayer attempt to teach the All-Wise God his duty.

The crater of Masayes struck the first conquerors of the New World with terror. They were appalled at its magnitude. Not understanding its character or use, the cruel Spaniards were prompted to deeds of cruelty and wickedness.

The island of Java owes to its volcanoes the honor of being consecrated to Siva, the God of destruction, "and it was in the very craters of these mountains that the worshippers of terror and death constructed their temples. Even at the present day worshippers of the terrible divinity take up their abode in the neighborhood of these craters, and at certain times make their offerings of seeds. Innumerable sacrifices have been offered to the volcanoes in order to appease their wrath. By an association of fear with ferocity, the priests of many religions have with great pomp and solemnity thrown victims into the yawning gulfs of these craters." In view of such cruelty we can readily understand the great good that will manifest itself in the promulgation of rational doctrines among the people of those countries in regard to God and His works.

In a limited and general way I have treated of volcanoes, and hinted at what seems to me to be their purpose and use. When they come to be regarded as a part of the original plan of the earth, especially planned by the All-Wise Architect for an object, then, and not till then, will the inhabitants incline to more favorable and just conceptions of God and His government. Inasmuch as they incline to imitate whatsoever kind of god they worship, nothing can be more important than that they be better informed in regard to the plan of God's works.

CHAPTER XXIV.

SLATE-CLEAVAGE.

An unknown writer has made the very sensible suggestion: "It is always best to think first for ourselves on any subject, and then have recourse to others for the correction or improvement of our own sentiments—thus we may reach truth which we should never have observed had we caught a particular mode of thinking from another. No principle should be received from education or habit merely. Let me observe before perusing the opinions of others. We check original thoughts by first learning how and what to think from others. The strength of others should be called to assist our weakness, not to prevent the exertion of our powers. By means of this dependence upon books, error as well as truth descends in hereditary succession."

I think this principle is applicable to some of the greatest minds of the nineteenth century. We can truly affirm that the age in which we live is one of too much learning. We have a striking illustration of this fact in a man of sound judgment such as Professor Tyndal. He breaks open a shortened biscuit and remarks the cleavage development. "You have only to break a biscuit across," he says, "and look at the fracture to see the laminated structure. We have here the means of pushing the analogy further. I invite you to compare the structure of this slate, which we subjected to a high temperature during the conflagration of Mr. Scott Russell's premises, with that of a biscuit. Air or vapor within the slate has caused the swell, and the mechanical structure it reveals is precisely that of a biscuit."

I think this observation of Professor Tyndal is not only original, but it is as sound as it is original, and is the whole key to slate-cleavage. Herein he is the real discoverer of slate-cleavage—thus far he has followed the bent of his own mind, and so far he is

correct. Now learning steps in and baffles his discovery. Previous to breaking open the biscuit he had unfortunately (I think) accepted or adopted another man's hypothesis of slate-cleavage. The geologist Sorby affirms that pressure is sufficient to account for slate-cleavage, and Professor Tyndal had this in his mind and thus associated the pressure hypothesis with the rolling-pin.

In regard to the sandstone-cleavage Professor Tyndal says: "You will discern that this cleavage is not a crystalline cleavage. It is molar and not molecular, and it has been agreed among geologists not to call such splitting as this cleavage at all, but to restrict the term to a phenomenon of totally different character. Those who have visited the slate quarries of Cumberland and North Wales will have witnessed the phenomenon to which I refer. We have long drawn our supplies of roofing from such quarries. Schoolboys ciphered on these slates. * * * What is the agency which enables us to split Honester Crag or the cliff of Snowdown into laminal from crown to base? The question is at the present moment one of the great difficulties of geologists, and occupies their attention perhaps more than any other."

I am inclined to regard Professor Tyndal's analogy or comparison of biscuit-cleavage with slate-cleavage as important and a key to all slate-cleavage.

"I do not," he says, "eat a biscuit without remarking the cleavage developed by the rolling-pin." While I cheerfully accept and adopt the observation and suggestion of Professor Tyndal, that the phenomenon or singular cause that produced cleavage in biscuit also occasioned cleavage in slate-rock, I go further, and believe that all rock cleavage is from one and the same cause. But while I adopt the view that biscuit and slate-rock are both dependent upon one and the same cause, I cannot accept the view that biscuit-cleavage is in any way dependent or "developed by the rolling-pin."

We have the means at hand of demonstrating in regard to the real cause of biscuit-cleavage; and it is important that we define the true cause, for if we give the wrong interpretation in regard to biscuit-cleavage thereby we shall most certainly fall into the same error in regard to slate-cleavage.

As a practical housekeeper and cook of thirty years' experience, I am qualified to state the cause of biscuit cleavage. The

rolling-pin is used very gently, not pressed, lest it destroy cleavage. In order to promote cleavage, what cooks designate flaky biscuit, after the dough is prepared and nearly ready for putting into shape, a small piece of the same is taken from the mass, mixed and saturated largely with butter until converted into a very soft butter-paste. This is gently mixed with the dough, or scarcely mixed rather, put on in patches—the two gently turned and worked over together, rolled slightly, not pressed; when cut into biscuit it is then ready for the oven. It is the *oil*, not the rolling-pin, that occasioned the cleavage.

Now, we have another plan of biscuit, without cleavage, wherein we can put just as much butter, or even more, and have no cleavage at all; but in this case we mix the butter thoroughly with dry flour before adding water or milk; in this way the oil simulates with the flour equally throughout the mass. But with dough that has been previously mixed with water oil does not so readily simulate as with dry flour. When cleavage biscuit has been properly prepared, in the process of baking oil inclines to raise to the surface of each soft layer that contains the butter—thus we have cleavage in biscuit.

We have abundant evidence of oil in slate-rock. Many of the slates used in the schoolroom in the time of my childhood were troublesome because of the oil spots that defected them. Upon the surface of each deposit in the original formation of slate rock much oil, from both vegetable and animal matter, would naturally develop a scum upon the wet and moist deposit; especially through the sun's influence it would be drawn to the surface, there to remain, bake and dry with the top earth. As it dried down it would burn or harden sufficiently with the surface soil to remain in a fixed position—each additional layer repeating the same process as the other. The surface of each stratum thus strongly impregnated with oil would naturally be more yielding and susceptible to change or movement by heat or other influences brought to bear upon it. Through this means it would suffer a diminution of cohesion in comparison with the under side of the same stratum of which it constitutes a part. The more thoroughly we investigate the phenomenon of slate-cleavage the more fixed the conclusion or conviction that Professor Tyndal's comparison of biscuit-cleavage

is correct, and in this way he is the real discoverer of slate and rock cleavage.

"Mr. Henry Clifton, Sorby and others have furnished us with a body of facts," says Professor Tyndal, "associated with slate-cleavage and having a most important bearing upon the question. Fossil shells are found in these slate rocks, and occupying various positions in regard to the cleavage planes. They are squeezed, distorted and crushed, illustrating," he thinks, "enormous pressure. * * *

We have seen shells crushed, the unhappy trilobites squeezed, beds contorted, nodules of greenish marl flattened; and all these sources of independent testimony point to one and the same conclusion, namely, that slate rocks have been subjected to enormous pressure in a direction of right angles to the planes of cleavage."

In reference to Mr. Sorby's contorted bed Tyndal says: "That, supposing it to be stretched out and its length measured, it would give us an idea of the amount of yielding of the mass above and below the bed. Such measurement, however, would not give the exact amount of yielding. I hold in my hand," he says, "a specimen of slate with its bedding marked upon it; the lower portion of each layer being composed of a comparatively coarse, gritty material, something like what you may suppose the contorted bed to be composed of. Now in crossing these gritty portions the cleavings turn, as if tending to cross the bed at another angle. When the pressure began to act the intermediate bed, which is not entirely unyielding, suffered longitudinal pressure; as it bent the pressure became gradually more lateral, and the direction of its cleavings is exactly such as you would infer from an action of this kind—it is neither quite across the bed nor yet in the same direction as the cleavage of the slate above and below it, but intermediate between them both. Supposing the cleavage to be at right angles to the pressure, this is the direction which it ought to take across these more unyielding strata. Thus we have," he says, "established the concurrence of the phenomena of cleavage and pressure—that they accompany each other; but the question still remains, is the pressure sufficient to account for the cleavage? A single geologist as far as I am aware answers boldly in the affirmative. This geologist is Sorby, who has attacked the question in the true spirit of a physical investigator."

The crushed shells and unhappy trilobites squeezed and flattened establish and illustrate not only the phenomenon of pressure, but unmistakable evidence of animal oil, another evidence in sustenance of Professor Tyndal's suggestion or comparison of biscuit with slate-cleavage.

CHAPTER XXV.

ORIGIN OF THE RACES—EVOLUTION, AND THE COLOR LINE.

"It is a provision of nature,"* said Professor G., "that animals and men take the color of their dwelling place. This serves as a kind of protection from their enemies. Both the animals and men on the black flood plains of the river Nile are black, while on the neighboring highlands where the soil is of a red-brown color, both animals and men are of a red-brown color. The men of these two localities both differ in figure and feature, yet they are known within a few hundred years to have come from a common ancestor."

These remarks are reiterations of observers long before the public. I find no intelligent reason for opposition to this sentiment or delineation of nature.

In the same lecture, in which Prof. G. reiterates the theory of men and animals taking their color from their dwelling place, he advocates another sentiment in an accompanying sentence. Although he advocates both, one demolishes the other, for he says: "The ground pattern (Adam) was black, had thick lips, retreating forehead, and almond-shaped eyes. Very long ago men of somewhat this type were found scattered all over the globe."

Whatsoever history or evidence have evolutionists to offer in support of the doctrine that the same type of black men were once found scattered all over the globe? They offer no evidence whatever in support of their theories. The evidences of nature which they refer to in every instance demolishes their conclusions. The evolution problem in support of the first man Adam being black corroborates a poor and ignorant colored man's reasoning upon the

*A lecture delivered by Professor Gunning at Linden Hall, Geneva, N. Y., December, 1885.

"color line." His reasoning from cause to effect evinces the character of a philosopher, even though he is unlettered. "God made our first parents black," he said, "all d'er chilun were black. Cain was black, den he slewed his bruder Abel; and de Lord said (awful loud), 'Cain, what did you do dat for?' Cain was awful scared! He trembled all over, and de Lord looked so awful sharp at Cain dat it *scared him white*; and dat am how Cain's posterity came to be white!"

I think the colored man's portrayal of Cain's humiliation and grief under Divine wrath exceeds anything heretofore written in the vocabulary of the English language.

Inasmuch as Prof. G.'s sentiments are in nowise original with himself, but the recapitulations and utterances of men who advocate the doctrine of evolution in common with each other, I purpose to review such portions of his lecture as has an important bearing upon the subject. However, in this short essay it will not be practicable to trace the ancestry of the human race quite as far back as the "polyp," or even the "oyster," or our nearer relative in ancestral lineage, the ape. It has been left to philosophers of the nineteenth century to discover our ancestor, the ape—an achievement the wise men of Greece failed to accomplish, although much nearer their ancestor in the line of lineal descendants.

"The Greeks," says Prof. G., "of the time of Homer ate like animals of the cat family, holding the head down to the food. They had cat-like eyes and were exceedingly coarse and homely in appearance. Later they changed their modes of living and became models of beauty. In almost every race we find some feature of the type (Adam.) The Negro retains the backward slope of the forehead; the Kalmuck keeps the high cheekbones; the Chinaman the almond-shaped eyes. The Greeks, and we, as descendants of the Greeks, have lost these Adamic features."

This dream in regard to ancient Greeks, if not authentic it is convenient for theoretical evolutionists while making out a case of progress from the oyster upwards and onward through many ascending grades, up to man of the present day. What evidence is there to offer in support of the theory that "Greeks of the time of Homer ate like animals" or resembled in any way the cat family, "holding the head down to the food?" Is not this an item of gossip that originated outside of the Lacedæmonian government,

by inferior people who were not only envious but unacquainted with the Spartans, and entirely ignorant of their customs or manner of living?

Homer was born 900 B. C., showing clearly that Lycurgus, the lawgiver, and Homer flourished about the same time. "In Xenophon's treatise concerning the republic of Sparta, from which Plutarch has taken the best part of Lycurgus—Lycurgus gives laws to Sparta in 884 B. C." "Strabo says that Lycurgus, the lawgiver, certainly lived in the fifth generation after Athenes, who led a colony into Crete. This Athenes was the son of Cissus, who founded Argos, at the same time that Patrocles, Lycurgus's ancestor in the fifth degree, laid the foundation of Sparta." "So Lycurgus flourished some short time after Solomon, about nine hundred years before the Christian era."

We have abundant evidence that Greece, long before Homer's time, had arrived at a high state of refinement and luxury. It was for this reason that Lycurgus through his laws completed the conquest of luxury. Homer was a Greek. The weight of evidence leads us to suppose that at the time of the great movement of Greeks into Asia, commonly called the Ionic migration, he emigrated into Asia, and it appears as though a part of his poems may have been composed after his emigration into Asia; for the Greeks were familiar with but a few of Homer's productions until Lycurgus, the Spartan lawgiver, obtained them in Asia; and having observed that they abounded in moral and political rules of conduct, carried them back into Greece. If the soul or mind has anything to do in chiseling the features, are we not warranted in supposing that neither Homer or the people of his nation resembled cats, either in look or manners?

Be it remembered that the Sabine women who were captured by the Romans were considered very beautiful, and they took pride in the fact that they were a colony of Lacedæmonians. There is no evidence whatever that can be brought forward to substantiate the theory that the variety of people of those times would suffer a diminution by comparison with the people of our own time.

Are we quite sure that philosophers thousands of years hence will not detect that some person of our own country at the present time possessed almond-shaped eyes, and on this evidence assume

that almond-shaped eyes were peculiar to this savage and barbarous age?

Through all the vicissitudes that may fall to the lot of inhabitants of earth during the next thousand centuries, may there not be some fragment of our literature survive the shock of time? May not this fragment possibly happen to disclose the large size of Chicago womens' feet—"a woman's shoe turned into a canal boat!" What valuable knowledge in regard to this age for future investigators to acquire! What splendid foundation for conjecture! Such disproportions would naturally excite wonder and amazement in refined circles. What important knowledge for college professors to deal out to their pupils in the far off future!

In expressing the idea that man is the product of evolution, Prof. G. said that "the only way that this could be proved was by comparison." He then proceeded to draw upon the canvas the brain of a fish. After explaining the uses of the various parts of this brain he added to the fish's brain the development necessary for the formation of a reptile; then added the developments necessary for the brain of a crocodile; from this he formed the brain of a bird. After explaining how brain of all the lower order of animals had developed, he then drew upon the canvas the outline of a gorilla, and "compared the formation of this man-like brute with man." "It is true," he said, "there is a vast difference between the civilized man and the man-like brute pictured upon the canvas. The comparison may be made," he said, "between the man-like brute and the brute-like man." The man with which this comparison could be made was a native of Southern Australia. "This man," he said, "did not differ so very much from the man-like brute; this man knows neither right from wrong. Where then shall we draw the line between man and brute? We cannot shut out the Southern Australian. This man does not differ so very much from the man-like brute. This man knows neither right from wrong. We must acknowledge our relationship to the brute creation. It is impossible," said Prof. G., "that the woolly and straight haired races ever came from the same source."

Whether they did, or did not, it is not my purpose at this time to discuss, but I simply desire to call attention to causes that may produce woolly hair. I have sometimes amused myself by drawing a long straight hair briskly between the thumb and finger-

nail to see it kinkle up like wool. The woolly appearance was occasioned by heat. The quick motion and friction excited electricity to heat, and the electric heat kinkled the hair up like wool. Now suppose in the interest of science the Professor should allow each hair of his head to be treated with this process by a magic hand, capable of treating every hair of his head at the same time—then view himself in the mirror and deny if possible that even the white race have hidden elements that under a tropical sun might possibly after many generations produce wool-like hair. It may be observed that even with the white race curly hair inclines to be short. Any amount of heat from whatever cause sufficient to crinkle up long hair like wool is quite liable to break and shorten it.

In our search for a connecting link between the real or civilized man and the man-like brute, is it necessary to explore Australia to find a man whose hand is shaped like the gorilla for one who does not distinguish between right and wrong? How can we be quite sure of the Southern Australian's incapacities for good until we have surrounded him with Christian influences? Educate him, instruct him in Christian doctrine. When this part is accomplished make him a bank cashier; should he prove honest and faithful in the discharge of this duty, we will then place him on a higher level than we can accord to many white and straight-haired cashiers. In sense of justice and reason, can we overlook the fact that in defiance of civilization and Christian influence the brute-like man with straight hair and white skin has proved himself the equal if not the superior in "pure cussedness" of the brute-like man with woolly head and black skin? Does not recent developments of the Greeley Polar Expedition reveal the fact that we have in our midst men who are white and straight-haired, educated in Christian doctrine, wholly incapable of being either civilized or Christianized; in their very natures they are cannibals? Sooner than face death as becomes men who have souls to continue hereafter in the presence of God, they murder and nourish their miserable bodies on human flesh!

Brute-like men are found under all climes and under all circumstances. It is not by the color of skin or length of their hair we can define the brute-like man. Does not justice and reason behoove investigators, not only in the interest of science but as a

duty to a much persecuted race, to recognize the true and real man wherever he is found? This comparing men with black skins and woolly heads to gorillas is quite common with a class who are pretenders of science. Such comparison must in the nature of the case be exceedingly painful to the colored race.

Can we be sure that the real man may not sometimes be found even with the Southern Australian described by Prof. G.? Although ignorant he may be, he may have a nature inherent that causes him to feel a desire within his breast to walk in the path directed by a high and unknown power.

Many illustrations of the real man under black skin and with woolly head might be given.

We need not explore the islands of the sea to find illustrations of the "brute-like man." We can find him in our own land, with white skin, and straight hair. Let us recall the case of Professor Webster, of Boston, who murdered Dr. Parkman; although many years have transpired since the remarkable event, in consequence of the distinguished and high position of the parties concerned it is still fresh in the memory of the middle-aged inhabitants of this country. Professor Webster who murdered Dr. Parkman was not only white and surrounded with Christianizing influences, but he moved in a high circle of society. He planned and executed one of the most atrocious and cold-blooded murders recorded in the annals of history. I think we have abundant evidence that there are brute-like men under all climes; and it is neither by the color of the skin or the length of hair that we are to define the brute-like man.

I find no intelligent reason for objecting to the theory of "animals and men taking the color of their dwelling-place." Admit this, and a man is a man regardless of color. Why did the biblical writers always call a man, a man—a woman, a woman—without alluding to their color? We read of Solomon receiving as his guest an Ethiopian queen—it is not recorded that he spoke or thought of her color. In view of our present custom, is it not singular that the biblical writers neglected while treating of persons who belonged to the African race to designate them as "colored?" I very respectfully call attention to the following facts in regard to Solomon's ancestors—I have gathered them carefully from authentic history:

*“Moses lead his army from victory to victory against Ethiopia until the enemy sued for peace, which was granted; one of the stipulations was that Moses married Tharbes the daughter of the king of Ethiopia,” (center of Africa.)

At an earlier period: “Jacob and his family, sixty-six persons, besides the wives of his sons and children of his daughters, crossed the Isthmus of Suez and reached the province of Goshen, where he was welcomed by his son Joseph.” * * * “After the death of Jacob his family continued to occupy the province of Goshen; seventy male persons together with the children and husbands of the daughters of Jacob and their servants rapidly increased to a powerful tribe.”

For the time that they remained in Egypt, receiving and reciprocating friendship with the Egyptians, is it not remarkable that the Egyptians declared that the Israelites were more numerous than themselves? Is it not evident that the marriage of Moses to Tharbes, (a woman from central Africa,) was according to the Israelitish custom of those times? Was not their increase augmented by numerous marriages among the Egyptians? We have evidence in the appearance of many of the Israelites, who, even to this day, retain many Egyptian marks—even to frizzed hair. “The whole Egyptian population are said to have underwent the pain of circumcision that the family of Jacob might amalgamate with them.” We are informed at the beginning of Exodus that Joseph and that whole generation died; our sources continue that the children of Israel were fruitful, increased in number and strength, and “there arose up a new king over Egypt who knew not Joseph, and they were miserably enslaved.” * * *

There is a period of about ninety years of peace and prosperity, of which we know no more than that “the children of Israel were fruitful and increased abundantly, and multiplied and waxed exceedingly mighty and the land was filled with them.” So the new king who knew not Joseph could say, “Behold, the children of Israel are more numerous and mighty than we.”

When Moses marched his people out of Egypt there were 633,550 males above twenty years of age. Take into consideration the males under that age in addition to those lost in wars, also the

*Wise's History of the Israelitish Nation.

diminution that must have occurred in consequence of Herod's slaughter of male infants, and we reasonably conclude that the females outnumbered the males. In connection with the time that intervened between Jacob's settlement in Egypt and the Israelite's departure from Egypt, their increase of population indicates that their numbers had been augmented and strengthened, not only by amalgamation with the Egyptians but by counting as Israelites the circumcised Egyptians.

We will now consider the Egyptians as a people previous to their amalgamation with Jacob's family. We find them a refined and opulent people. Their treatment of Joseph does indeed illustrate their kind consideration of servants. The Egyptians were prejudiced against shepherds. Joseph therefore, when acquainting Pharaoh with the arrival of his tribe and introducing to the king his brothers, did not tell him that they were husbandmen, he merely stated that they were keepers of sheep. Pharaoh received them kindly and directed Joseph to give them the best part of the land of Goshen.

The Egyptians imparted science, philosophy, architecture, sculpture, the art of writing, mathematics, chemistry and medicine to the Israelites and other nations. We can appreciate these benefits, and the many blessings that have been derived from them, without taking the trouble to prove just how much or how little wool covered the heads of Egyptian sages. "The Pyramids of Egypt—mighty monuments of a past civilization, stood on their firm bases when Britain was an island inhabited only by savages whose dress was the paint that besmeared their bodies or the skin torn from some wild beast."

There is no history of those times to sustain the view that the color of skin was a standard of respectability. Even the brave Cæsar, so accustomed to success that Parnassus was as much terrified at his name as at the strength of his army, was captivated to that extent by the charms of Cleopatra, (an Egyptian queen,) that she wrenched from him kingdoms. I feel sympathy for his brave veterans who censured his conduct. I think if they had thought to whisper in Cæsar's ear "nigger," "nigger," "colored," he would not have been so enamored with Cleopatra, and probably would have saved a page of weakness that is recorded in history against Cæsar.

The historian, I. M. Wise, writes: "The people which Moses brought from Egypt were not, as some erroneously suppose, a host of demoralized slaves, who were debarred from all sorts of knowledge and civilization; for such a people could not have been subjected to the organization that Moses effected, nor would they have accepted laws and religion so intelligent as those contained in the old Mosaic dispensation. There were amongst them a vast number who had been born under the degradation of slavery; but the bulk of the people who lived in Goshen were personally free, and were occupied with agriculture and kindred arts. We find among them in the course of this period artists in different branches of the useful and fine arts; a caste of warriors who came with them out of Egypt; a political organization divided into tribes with official chiefs, and the tribes subdivided into families with chiefs of the families, which were again subdivided into father-houses with officials, chiefs; besides which we find among them in Egypt a council of the elders; consequently, they must have been an organized and civilized nation in Goshen dependent on Hyksos kings, then the rulers of Egypt." I make reference to these facts to illustrate the learning the Israelites took with them out of Egypt.

Of the early arts and achievements of the African race we have no history, but we have abundant evidence that they (a dark race) were at one time a mighty people. Wars and vandalism have destroyed their early records. Of their monumental ruin we have no history. Travelers enquire from whence came the mighty people who reared and fashioned those monuments that have held the world's admiration through all the centuries of which we have any record, and whence have they gone? Their works of art stand up grandly and speak silently but eloquently with the breath of ages for the once noble and fallen people of Africa. The earliest history we have discloses their weakness and fondness for amalgamation with the white race.

"The entire Egyptian population suffered the pain of circumcision in order that they might marry in among Jacob's family." Why this sacrifice on the part of a great and noble people, high in social position, holding political power, and their wealth the envy of the world? Why so much concession on the part of the Egyptians towards a people who were dependent upon their charity? Is

my sister: and Abimelech king of Gerar sent and took Sarah. But God came to Abimelech in a dream by night, and said to him, Behold, thou art but a dead man, for the woman which thou hast taken is a man's wife. But Abimelech had not come near her; and he said, Lord, wilt thou slay a righteous nation? Said he not unto me she is my sister? and she, even she herself, said, he is my brother. In the integrity of my heart and innocence of my hands have I done this. And God said unto him in a dream, Yea, I know that thou didst this in the integrity of thy heart, for I also withheld thee from sinning against me; therefore suffered I thee not to touch her. Therefore Abimelech rose early in the morning and called all his servants and told all these things in their ears; and the men were sore afraid. Then Abimelech called Abraham and said unto him, What hast thou done unto us? and what have I offended thee, that thou hast brought on me and on my kingdom a great sin? Thou hast done deeds unto me that ought not to be done. Abimelech said unto Abraham, What sawest thou, that thou hast done this thing? And Abraham said, Because I thought surely the fear of God is not in this place, and they will slay me for my wife's sake. And Abimelech took sheep and oxen, and men-servants, and women-servants, and gave them unto Abraham, and restored him Sarah his wife. And Abimelech said, Behold, my land is before thee: dwell where it pleaseth thee. And unto Sarah he said, Behold, I have given thy brother a thousand pieces of silver; behold, he is to thee a covering of the eyes unto all that are with thee, and with all others; thus she was reproved."

Isaac, the son of Abraham, is represented as marrying Rebekah, a relative of Sarah his mother, who is described as very fair. And while Isaac dwelt in Gerar "He feared to say she is my wife; lest, said he, the men of the place should kill me for Rebekah, because she was fair to look upon. And it came to pass when he had been there a long time, that Abimelech, king of the Philistines, looked out of a window and saw and beheld Isaac was sporting with Rebekah his wife. Abimelech called Isaac and said, behold of a surety she is thy wife; and how saidst thou, she is my sister? And Isaac said unto him: Because, I said, lest I die for her. And Abimelech charged all his people, saying, He that toucheth this man or his wife shall be put to death."

The quotations I have made from the Bible go to show that

the Israelites did not give the black men credit as a "God-fearing people" that their honorable and many charitable acts deserved. Notwithstanding the continued proof of honor and generosity manifested by the dark race, the Israelites always suspected them, as we learn by the language of Abraham:

"And Abraham said, because I thought surely the fear of God God is not with this place; and they will slay me for my wife's sake."

Northern tribes appear to have accomplished victory over the dark race by amalgamation more than by the sword. Through history we trace their weakness for amalgamation with the white on every hand. In Wise's history of the Israelitish nation he says: "Moses led his army on from victory to victory against Ethiopia until they sued for peace." But we learn by Josephus that the victory over the Ethiopians was accomplished by the stipulation of amalgamation, a thing the sword failed to accomplish. "Tharbis was the daughter of the king of the Ethiopians," says Josephus, "she happened to see Moses as he led the army near the walls; she fell deeply in love with him; and upon the prevalency of that passion sent to him the most faithful of all her servants to discourse with him about their marriage. He thereupon accepted the offer, on conditions that she would procure the delivering up of the city; and he gave her the assurance of an oath to take her as his wife; and that when he had once taken possession of the city he would not break his oath to her. No sooner was the agreement made than it took effect immediately; and when Moses had cut off the Ethiopians he gave thanks to God, and consummated his marriage, and led the Egyptians back to their own land."

Here we have an illustration of an Ethiopian king surrendering a city and allowing his people to be put to the sword in order that his daughter should become the wife of a man who was without doubt quite fair.

Long after this event, even in the wilderness, Moses was severely criticised by his brother Aaron and his sister Miriam for his marriage to Tharbis, for we read in the Bible, that "Miriam and Aaron spoke against Moses because of the Ethiopian woman whom he had married: for he had married an Ethiopian woman." Wherefore it is recorded: "And the anger of the Lord was kindled against them; and he departed. And the cloud departed from off the tabernacle and behold Miriam became leprous, white as snow:

And Aaron looked upon Miriam, and beheld she was leprous. And Aaron said unto Moses, alas, my Lord, I beseech thee lay not the sin upon us wherein we have sinned."

We are instructed that "Miriam was shut out from the camp seven days; and the people journeyed not till Miriam was brought in again." Miriam was evidently displeased with her brother for marrying a black woman from Central Africa. Much unhappiness was the result of this displeasure. It not only caused domestic unhappiness, but a large army was delayed seven days. We can understand that the commotion in consequence was no small event.

Now, if Tharbis had a true regard for the Ethiopians as well as a proper respect for her own dark color, together with consideration for her exalted station in life, she would never have been the occasion of surrendering a city of her father to the Egyptians because of her love for their general in charge of the army (supposed to have been fair.) We learn through Josephus that it was through Tharbis's influence that the city was surrendered.

In taking a retrospect of the world's history, we find in its earliest records Africa as the center of education, refinement and luxury. We learn, also, that class and distinction prevailed among the black race. The quotations I have made, I think, go to show that their great weakness was the same then as now—a tendency to amalgamate with the whites. Kings and their most distinguished citizens were captivated with strangers who went into Egypt to receive charity. The Egyptians surrendered to them their goods, money and servants for no other reason than that they were fair.

The people of the North understood fully the reason of so much concession on the part of a superior people who had darkened under a southern sun. When travelers and wanderers from northern climes received great riches as a free gift, and even political distinction as well as official dignity, for no other reason than that they were fair, was it strange they learned by these lessons to disregard their benefactors who were of a southern hue? Can there be any hope of the black race retrieving the possessions they have lost until they learn to respect their own color? When they respect themselves they will refuse to amalgamate with the whites. God delights in variety, and he has made men both black and white and pronounced His works good.

If it was a sin for the sister of Moses to look down on the

Ethiopian woman, was it not a greater sin for Tharbis to look down on her own people? Ought people to think less of themselves for any peculiarity that has descended to them from an All-Wise God? I have known one colored woman who had proper respect for her own color; I trust there are many more. She was in my employ at the time of the birth of one of my children. Although she was not employed as nurse, as the baby grew to notice things and appeared playful, Julia appeared quite fond of baby; but she often expressed regret that baby was so "white-livered," (meaning fair.) She said she "loved the little thing, but would love her much better if she were not so white-livered." Julia was an intelligent girl, well featured and splendidly formed, not very dark. But she scorned and denied the idea of having any white blood in her veins. She was strictly honest and truthful, and exceedingly intelligent for a girl of eighteen. Her life was short but full of interest. I am quite sure that if Julia had been in the place of Tharbis, a king's daughter, she would never have been the occasion of surrendering a city of her father to the Egyptians to gain for herself a husband, their general, (especially if he was fair.)

At the present time in our own country amalgamation is a great curse to the African race. They amalgamate with a low class of whites, which to say the least is very demoralizing. In this way the colored race is doomed to be kept down. This is not all; if one chances to develop any good point, those prejudiced against him at once attribute the merit to the result of a little white blood he has in his veins. In the interest of science amalgamation is to be regretted. Were it not for amalgamation scientists could ascertain the effect of a northern climate on the black race—especially now that slavery is abolished. No new blacks are being imported into this country.

If God has made the blacks a distinct race, should they not prefer to so remain? To do otherwise is a violation of natural law for which they have already suffered much. If it is a southern climate that has occasioned a black skin and nothing more, those in a northern clime can be content until nature has accomplished its work of bleaching. Should not all of God's children respect themselves? We read: "If thou shalt say in thine heart, these nations are more than I, how can I dispossess them?"

